SCIENTIFIC AMERICAN

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THE GORGE ROAD AT NIAGARA FALLS.

The traveler in Switzerland cannot fail to be impressed by the engineering enterprise expended in catering to the traveling public. Even the regular railroad routes are made subservient to the demands of the tourist. The St. Gothard Pass, which is the locus of the most wonderful piece of railroad engineering in the world, is crossed by regular trains, but special observation cars are used, to enable the surpassing wonders of the route to be seen by the passengers. Everywhere throughout the region the same story is told. Mountain railways, either cog-rail or cable traction system, are found everywhere. Some are operated by electricity derived from the neighboring falls. Others are operated by steam locomotives which run on the level without cog rails, and which on the steep grades engage with the cog rails until the ascent is mastered. Thousands of people carry with them no grander memory of Switzerland than that afforded by the trip up the Grundelwald railroad, where the glories of the Moench, Eiger, and Jungfrau are seen at close quarters, and where the thunder of avalanches is repeatedly heard, and often the descent of the great snowy cataract from the sides of the Jungfrau is witnessed.

In the United States it seems as if we were a little remiss in making provision for lovers of natural beauty. Show places we have in abundance, but efforts to properly develop them seem wanting. The dedication of the old switchback road at Mauch Chunk, Pa., to pleasure trips and the building of the cog-rail road up Mount Washington, N. H., were the earliest efforts of any moment in this country in the direction indicated. In our present issue we illustrate another, which is designed to prove one of the greatest attractions of Niagara Falls. It is the Gorge Railroad.

The lover of Niagara has two places which are particularly dear to him. One is the wild scene above Goat Island—the rapids above the Falls. Below them is the other scene, the Great Gorge Rapids, sometimes termed the worst piece of water in the world; the scene of many exploits or attempts at exploits from the adventurous voyage of the old steamer the Maid of the Mist through its angry waves to the trips in barrels and with life preservers, or even unassisted, of later adventurers. The Gorge Electric Railroad, operated by the Niagara Falls & Lewiston Railroad Company, is a tribute to the scenery of the lower Niagara River, and is a unique and interesting enterprise which will attract the admiration of many travelers. It is operated in connection with the hotel and observation tower which have been erected by the same company in the village of Niagara Falls, near the State Reservation. From this tower a view of the entire area is obtained, and the route of the winding gorge road can be traced as it descends the cliffs. Starting from the hotel, the road runs through the streets and out into the country, until a point about a half mile above the cantilever bridge on the edge of the cliffs is reached. Here the descent begins, and with a maximum grade of three per cent the track runs down the sides of the cliff toward the great rapids. The lower level is reached a short distance below the cantilever bridge, and thence the road winds along the foot of the cliffs twenty feet above the usual water level.

Our illustration shows the scene at the rapids near the point where the river level of the road begins. Hence the rapids are in their wildest commotion. The great volume of water which has come over the falls is crowded and forced through a narrow space. The rate of the current in places is put as high as thirty miles an hour, but it forms numerous eddies and countercurrents, so that its average is far less than that. As the trolley cars run along its brink it is interesting to watch the logs which sometimes are seen almost keeping up with the electric cars. At the place shown the spray flies far and wide, sometimes falling upon the cars. About this point the water in the center of the rapids sometimes is thirty feet higher than that at the sides. A very curious feature is the formation and maintenance of almost stationary waves.

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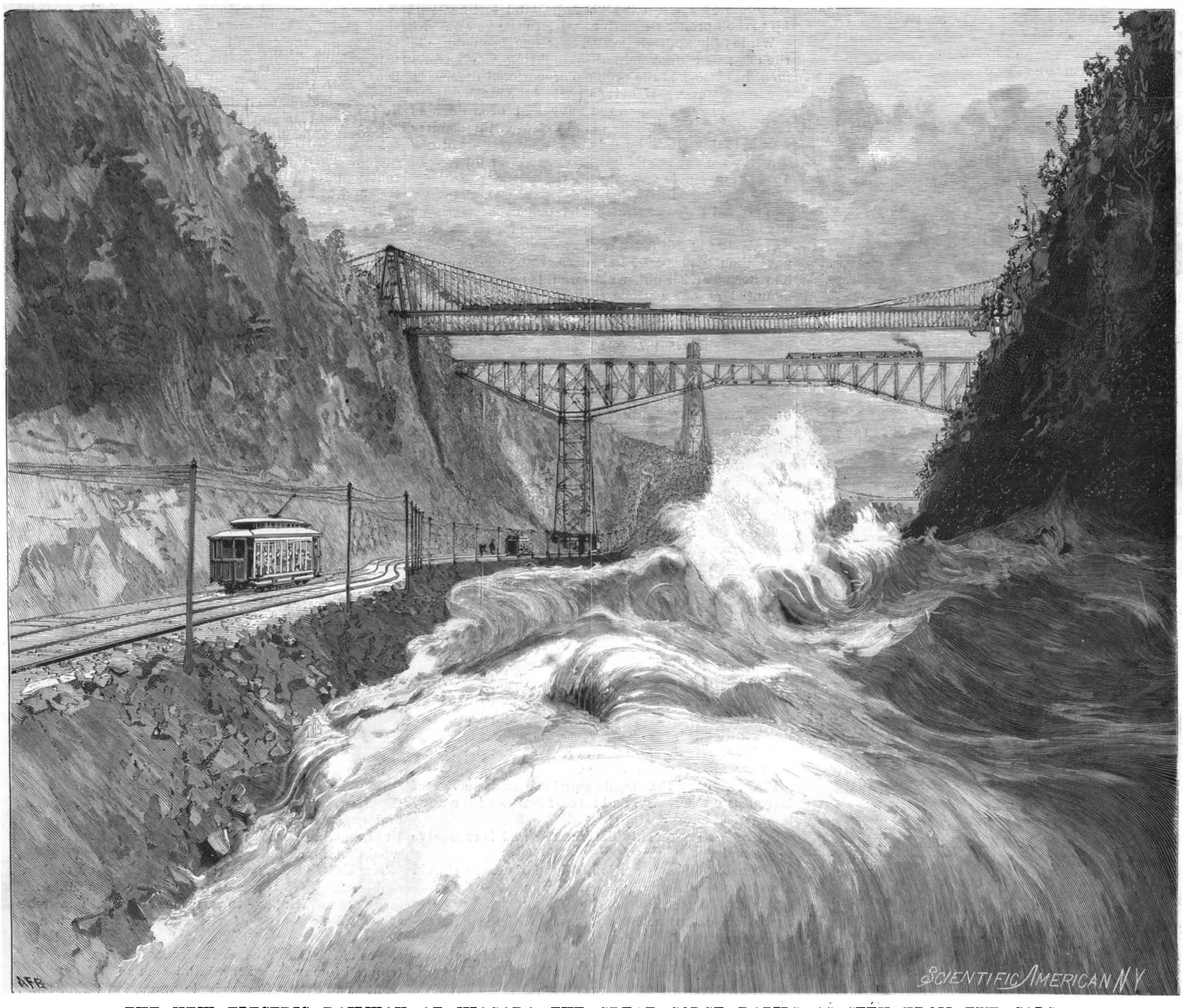

THE NEW ELECTRIC RAILWAY AT NIAGARA—THE GREAT GORGE RAPIDS AS SEEN FROM THE CARS.

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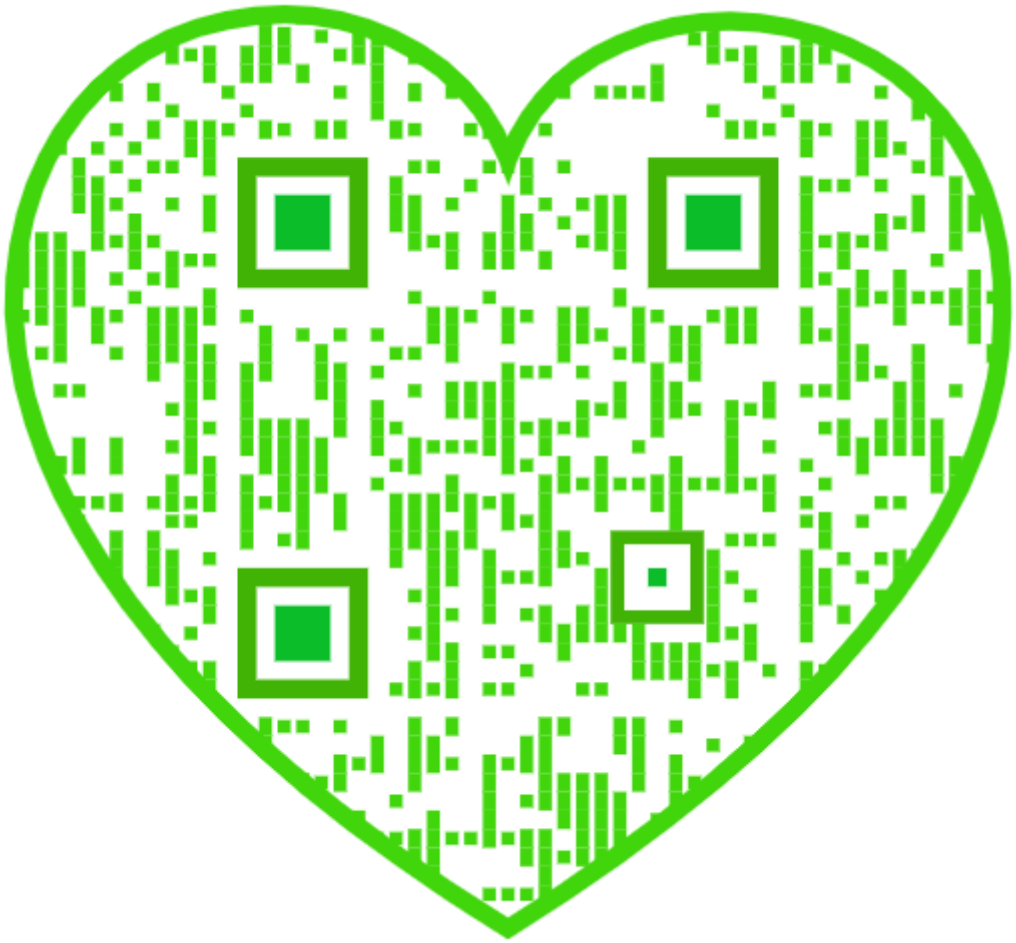

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THE PROPOSED INCREASE IN OUR NAVY.

It is announced from Washington that the House Naval Committee has recommended that an appropriation of over $30,000,000 be made for the addition to our navy of four battle ships and fifteen torpedo boats. This would be double the amount of any previous naval appropriation.

The SCIENTIFIC AMERICAN has for many years realized that our national defenses, both on sea and land, were not keeping pace with our commercial growth. We have been favorable to such a reconstruction of both forts and navy as should enable our country to present an impregnable line of defense against the attack of any enemy or possible combination of enemies.

We have always felt, moreover, that such efforts of reconstruction should be directed toward this one single object of defense; and that the sums of money appropriated for this purpose should be distributed between land and sea defenses in such proportion as to secure the most effective results.

In view of the fact that we are a Republican and not an Imperial people, whose interests are domestic and not colonial, we have always felt that the sphere of our naval and military operations lay, or should lie, within our own shore lines, and that therefore our coast fortifications should be regarded as being practically our first line of defense; and that our navy should be considered as complementary to our land defenses, and should be designed strictly with a view to co-operation with the forts in our various roadsteads and harbors.

We have noticed with regret, and some measure of apprehension, that, while naval appropriations have been forthcoming at a rate that has created a complete modern navy in a few years' time, the land fortifications, which, as we have seen, should be considered as our first line of defense, have been practically neglected. So antiquated are the old fortifications, and so incomplete the new, that for purposes of co-operation with the navy they are of very limited value.

Now, in view of the foregoing considerations, we think the time has come for the government to bend its whole energies to bringing our land fortifications up to their proper strength relative to the new navy.

While fully appreciating all that has been done in the past, we cannot help thinking that the government has attacked the problem of national defense at the wrong end. If only a part of the money which has been expended upon the navy had been devoted to constructing a system of land defenses, this country would to-day have been impregnable against attack from the sea and would have possessed the nucleus of a very respectable navy besides.

The Endicott Board of 1885 devised a complete system of land defenses, which included every maritime city of importance. The total estimate for this scheme was about $100,000,000. We have spent upon the new navy about $110,000,000 up to date. If the above scheme had been carried out, there would now have been mounted at our various seaports no less than 1,576 guns of 8 inch caliber and upward, as against the present 136 guns in the navy, and 360 rapid fire guns against the navy's 187.

Such a comparison as this calls for no comment, further than to say that a gun mounted within the shelter of a fort is worth at least two mounted on the unstable and exposed platform of a ship's deck.

The arguments in favor of concentrating our energies upon our land defenses rather than upon our navy are both practical and ethical—these latter being based upon the spirit of our constitution and upon those broad principles which dominate our national life, and give us our strong national individuality.

The practical arguments were admirably classified by Senator Proctor in a recent speech before the Senate, and we give them in full:

First. That a proper system of land defenses will make our great cities safe from any naval attack.

Second. Such a system can be constructed for a sum many times less than the cost of a navy like the great navies of Europe, and for a sum that may reasonably be expended.

Third. Land fortifications are much more efficient for coast defense than a navy, and when once constructed are durable, cheaply maintained and easily strengthened.

Fourth. The defense of our cities cannot be left to the navy alone, however large.

Fifth. A navy that would equal the great navies of Europe is unnecessary, and its cost makes such a navy impracticable.

Sixth. A navy quickly deteriorates and is expensive to maintain.

Seventh. The construction of land defenses should always precede the building of a navy.

The ethical argument can be briefly stated by saying that when we have adequately provided for home defense, our duty in the matter of military and naval preparation is done. Our navy should be of such proportions only as are necessary for successful co-operation with the land defenses. Our naval programme should be laid down with strict regard to a home, as distinct from a foreign—a Republican, as distinct from an Imperial policy.

Great Britain's navy, by way of example, has been called into existence by the exigencies of the defense of an empire whose widely scattered colonies bring her into hourly danger of conflict with any one of a dozen different governments. The secret of the strength of our great republic lies not merely in the political and geographical union of its many States beneath one flag and within a single boundary line, but also in the fact that it has been both able and willing to concern itself with its own internal development, and has in the past and we hope it will in the future carefully abstain from embarrassing entanglements with the affairs of other peoples and nations.

The building up of a navy of European proportions would be a distinct departure from the national traditions above mentioned, and would involve the entering upon a policy whose execution would be as exhausting to the national treasury as its principles would be opposed to the spirit of our constitution, and subversive of the brightest hopes of its founders.

WEATHER TESTS ON THE NEW YORK UNDERGROUND TROLLEY ROAD.

In our issue of February 22 we gave a fully illustrated description of the underground trolley system now in operation in New York, and stated that it could not be called experimental in the usual sense, as the line was in daily operation and gave the greatest satisfaction. Nevertheless, there are some engineers who have claimed that, though the open conduit might stand the trial of ordinary weather, it would inevitably break down under the attack of a heavy storm of snow and rain. Such a trial was had on Monday, March 16, when a total fall of ten inches of snow was recorded; and the way in which the Lenox Avenue road endured this supreme test proves that the conduit system, as carried out in New York City, is a distinct success, even under the most trying conditions.

It commenced snowing at noon on the previous Sunday, and continued to snow more or less for twenty-four hours; the total fall being ten inches. During Monday afternoon the snow gave place to rain and sleet, and the streets were soon deep in a heavy slush. On Tuesday the rainfall was exceedingly heavy, and this, combined with the rapidly melting snow, put a heavy tax upon the surface drainage system of the city, and incidentally upon the cable and electric conduits of the Metropolitan Company.

The operation of the Lenox Avenue and Lexington roads was carried on throughout the storm without a break. There was no short circuiting, nor any delay that could be attributed to failure of the purely electrical part of the plant. The large amount of surface drainage was carried off without inconvenience; and the water in the conduit was never high enough to threaten the insulation, or in any way interfere with the current.

There are twenty-one cars on the Lenox Avenue line, and they were all in constant operation; nineteen of them running on the regular service and two of them acting as snow sweepers.

The full number of trips was made, and the time that was lost on each trip was due entirely to the slipping of the wheels, and to the increased resistance due to the deep snow. As soon as the electric sweepers had cleared the track the regular schedule time was maintained.

The seven cars on the Lexington Avenue line had a trying experience throughout the whole of Monday. Owing to the scarcity of sweepers, the tracks were not cleared, and the tracks were covered with four or five inches of slush. In spite of this, schedule time was maintained, and there was not a case throughout the whole storm of a "grounded plow."

The Lenox Avenue cars are run under a two and one-half and three minute headway, and the actual running speed is about ten miles an hour. That this service should have been maintained under such trying circumstances for the greater part of forty-eight hours without any breakdown or apparent distress, either in the power house or on the line, is a fact well worthy of record; and the advocates of the open conduit system will write the item down in red ink in their note books.

THE GOVERNMENT TESTS OF THE STRENGTH OF TIMBER.

When the government determined to undertake an exhaustive series of tests of the strength of native American woods, the fact was received by builders and engineers with much satisfaction. It was realized that the publication of the results of these tests would fill a long felt want.

The United States are rich in all kinds of timber, and especially in those woods which are suitable for structures which have to carry heavy loads. The great pine and fir forests of the extreme Northern and Southern States, with those that clothe the lower slopes of the Cascade and Rocky Mountains, have contributed to our agricultural and commercial development to an extent that is little understood. Without the cheap and abundant timber with which the pio-

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neer railroads were able to span broad rivers, and throw lofty trestle bridges across the innumerable ravines and canyons of our mountain passes, our great system of transportation could never have been so rapidly developed—that is, its development would have had to wait for the capital and time necessary to the erection of more costly steel and iron structures.

In addition to the extensive use of timber in heavy structural work such as bridges and buildings, a large amount is used annually in the construction of rolling stock in the form of both freight and passenger cars, as well as in the various minor branches of the engineering and building trades.

It is a surprising fact that, until the above mentioned government tests were undertaken, there had been no systematic attempt, on a large scale, to ascertain the exact strength of the various kinds of American timber. The tables contained in the engineering textbooks had been drawn up from tests of a limited range, and of more or less imperfect execution. As a consequence they were—and indeed are to-day—viewed with more or less distrust by engineers and builders. The result of this is that motives of selfprotection will lead the designer to select the larger rather than the smaller figures, and his structures will be more bulky than reasonable safety demands.

The government tests were undertaken with a view to providing a table of the strength of timber which should include not only those woods which are used in the heavier structural work to which we have referred, but also the woods which are used in the various arts and manufactures. Timber, again, is so variable in its quality, that it is necessary to test a much larger number of specimens than is customary in the case of iron and steel, in order to get a reliable average of its strength. Writing on this subject to Walter G. Berg, C.E., of the Lehigh Valley Railroad, Dr. Fernow says:

"You will, however, understand that this test work differs from other testing done hitherto, in that it places reliance only on large numbers. Hence, for instance, the 276 tests on Oregon fir would hardly warrant us in drawing any conclusions. They are not better than any other tests, except that their moisture condition is noted, which is, to be sure, one important advantage.

"On the other hand, for the Southern pines we may claim to have such a series of data as to make it unnecessary for anybody else to test these timbers again; they cover such a large number, under all sorts of conditions, that absolute confidence in the reliability of the data for the range of strength in the species should be accorded to them.

"At the same time the confusion existing in engineers' tables with regard to the kind of pine (names or species) should not be permitted any longer, especially since the various species promiscuously referred to as Southern pine, yellow pine, pitch pine, etc., differ up to 20 per cent in average strength values."

How elaborate were these tests, and how great will be the value of the results, may be judged from the fact that over 20,000 separate tests were made on the Southern pines alone.

Altogether about 40,000 tests have been made to date. Of these, only the Southern pine tests have been published; and a large mass of unpublished tests, to the number of 20,000, remain pigeonholed for want of the small appropriation necessary to cover the expense of printing. A bill making special appropriations for the continuance of this work has been introduced into the Senate, but its passage is regarded by Dr. Fernow as exceedingly questionable. If the work should be stopped, it will be a great loss to the industrial world at large. Nothing reliable is known about the strength of our Maine and Michigan timber, nor of that which comes from the great forests of Washington, Oregon, and California. It is quite possible that the lumber interests, especially of these Western States, are suffering because the high average of elasticity and strength of their timber has never been reliably tested, and is, therefore, not known. Proof of this was made recently at Tacoma, when a comparative test of Douglas fir with Eastern oak showed a decided superiority for the Western timber. Nothing short of certified government tests would enable the fir to compete in the markets as a structural material with the renowned Eastern oak.

The cost of completing this good work would not be great. Compared with the value of the results, it would be very small. Engineers, architects, builders, and, indeed, all workers in wood, ought to use their influence to secure the completion of a work that so vitally affects their interests.

The Effect of a Cannonade.

Sir William Thomson has recently been making experiments to discover what the effect of a cannonade of quick-firing guns would be on board the vessel firing and the ship subject to the fire. He finds that after fifteen minutes' firing the survivors of the crews of both vessels would be reduced to a state of mental, if not physical incapacity, owing to the concussion of the projectiles on the sides of the vessel and the noise of the guns.

The Rights of the Machinery Inventor.*

When purchasing an equipment of machinery, the mill owner takes upon himself the risk of being called upon to pay for one or more of each line of machines the second time. The average mill owner may, however, find considerable satisfaction in knowing that in these days a patent gives to the holder only a presumptive right of property. When it is infringed—no matter how wantonly—the trespasser is permitted to protect himself by proving at the trial that the invention was first made by some other person, and not by the plaintiff; though it may have been kept a profound secret, and would never have seen the light, but for the subsequent invention of the patentee; or he may defeat the action by showing that the same contrivance is described in some publication printed in any foreign language, and which publication was never seen or heard of in this country before the date of the trial when this proof is made.

The liability to be set at defiance in this matter continues throughout the entire life of the patent. And no matter how often the validity of the patent may be established in court, it is equally liable to be called in question on any new trial. The evils of the present law are that there is a great deal of uncertainty in the mode of ascertaining what really is a new invention. Hence, when a patent has been granted, if it is of such a nature as to lead to competition, infringements are almost matters of course, and the only mode of discovering and checking the infringement is so tedious, costly and ineffective that inventors generally pass their lives in constant litigation, fighting in detail a succession of imitators who often have nothing to lose by defeat, and therefore entail all the greater burden on the legitimate manufacturer. The disheartening and prostrating influence that this is calculated to exert upon those who devote their lives and energies to the actual improvement of the milling and mechanical arts, and to making those discoveries which have given a character to the present age, can readily be perceived without comment.

In the opinion of many, however, any remedy that can be contrived would be more to be feared than the evil which was sought to be remedied. But is there any good reason for such a conclusion? Why should the holder of a patent, which is presumptive evidence of title, be forever liable to have his right called in question by every mere trespasser? Such a course is not permitted in relation to any other species of property. The wrong doer is not in other cases permitted to protect himself by calling in question the title of him who has prima facie evidence of ownership. Why should he do so in relation to this species of property? It is true, that if a patent should be granted for a machine already in common use, and which is therefore fully the property of the public, any person sued as an infringer should be permitted to protect himself by showing the facts of the case. But why should a person who has trespassed upon what he does not pretend to be public property be allowed to defend himself by showing the property to belong rightfully to some other individual?

The analogies of the law relating to tangible property lead to this same conclusion. If one person make an inclosure upon the lands of another, his right of action against any trespasser is complete and unquestionable. But if he were to inclose a portion of the public highway, no such action would be maintainable, for his inclosure is itself a nuisance, which any one may disregard or remove. Analogy also suggests another provision, still more important and effectual. So great are the evils resulting from uncertainty of title to real estate, that in most of our codes means are provided by which the presumptive owner may file a bill in equity, and bring such uncertainty to an end. Is there anything in the species of property we are considering which renders a similar provision out of place or objectionable? If the holder of a patent were permitted, under proper regulations, to file a bill to quiet his title, either in one of the federal courts already organized or in a special tribunal created expressly for that purpose, would not the result prove as harmless and as beneficial as though the patent were for real estate? The patentee would then be enabled to feel that security which would give double value to his property, and would be free from that continued series of vexatious lawsuits which often render the most valuable inventions the sources of continual annoyance, if not of eventual pecuniary ruin to their authors.

As a short and effectual remedy for all these difficulties, it is the opinion of some who have thought upon this subject that the whole system of granting patents ought at once to be abolished. But is it not one of the cardinal purposes in the establishment of all governments to protect the citizen in undisturbed enjoyment of his property? This species of property is by the Constitution placed under the special guardianship of Congress, and it is difficult to perceive why it is not as much entitled to legislative favor and protection as any other property. If inventions are not to be made capable of being effectually appropriated, why should lands, or any tangible article of personal property, be so? And yet no one proposes to return to the savage state, so far as these kinds of property are concerned. To do so in regard to inventions would be a retrograde to civilization, as well as a departure from the plainest principles of justice.

No title can be more unquestionable than that resulting from discovery, unless it be that which is derived from actual creation. The recognition of either, if not instinctively in the brute, is certainly found in the lowest and most uncultivated orders of human intelligences. The bird seems to have a sense of property in its nest, the beast in his lair, the savage certainly in the cave he has discovered or the weapon he has made. Even the first occupant of a tract of land, which he has neither discovered nor created, has a title which, in the absence of a better, is protected by the governments of all civilized countries. To none of these is the title of the inventor at all inferior. He has created or discovered all that he claims the right to possess. The property for which he asks protection might never have existed but for him, who has created it out of nothing. At least, he has called it into active being, and made it the servant of mankind, subject to the limited right of ownership, which he claims for himself. Were the law to afford no protection to the inventor, his only means of reaping any particular benefit from his invention would be by hiding it from the knowledge of the world, as in Turkey the peasant secretes his wealth lest it should become the prey of that rapacity against which the laws afford no sufficient protection.

Taking it altogether, reforms in the operation of the United States Patent Office will be difficult to accomplish. The Patent Office, silent and unobtrusive in its course, connecting itself with none of the agitations of the day, and demanding nothing from the public treasury, can only ask the assent of the national legislature to such an arrangement of its instrumentalities as shall secure efficiency to its action.

* By Charles Mason, in Milling of February, 1896.

From New York to Paris by Land.

Mr. Harry de Windt is an Englishman, but was born near Paris, in 1856. His father was English and his mother French. He has already distinguished himself by the expeditions which he has made under difficult conditions. He has been to Siberia three times: in 1887, in 1890, and in 1894—his mission this last time being to visit the Russian prisons—and finally he crossed Asia and Europe, going by land from Pekin to Calais.

Upon his return from his last journey, he conceived the idea of a new expedition, says the Tour du Monde, which he has now undertaken. He took passage on an American vessel, the captain of which—an experienced sealer—told him that he had crossed Behring Strait on the ice seven times. Mr. De Windt decided immediately that he would try to go from New York to London by Alaska, Behring Strait, and Siberia, and he has just started for America, where he will begin his journey, giving a series of lectures in the cities through which he passes. At San Francisco he will find his servant, George Harding, who was his faithful companion in his former expeditions, and whom he has charged with the preparation of all baggage necessary for the expedition. At Vancouver he will meet Captain Adair, the sealer whose stories gave him the idea of crossing Behring Strait, and who will accompany him. Mr. De Windt expects to leave Vancouver by the end of March with a party of Indians or half-breeds.

The crossing of an unknown part of Alaska will be attended with considerable difficulty, and, in fact, danger. Nulata will be the last inhabited point of American land passed by the expedition, which will, from there, ascend Cape Prince of Wales, so as to cross the strait at the narrowest point. Mr. De Windt expects to cross on sledges drawn by dogs and to strike land in Asia at East Cape, from which he will direct his course to Iakoutsk. He has set eight months as the probable length of time required by the journey, a most difficult one because of the cold incident to four months of polar night. The crossing of Behring Strait will take about twelve days, on account of the numerous accidents that will be liable to occur to the sledges.

Mr. De Windt expects to return to London in the autumn of 1897, and he calculates that his long journey will cost him over $25,000.

THE deepening of the Hudson to 12 feet, as far as the State Dam, seven miles above Albany, will probably be completed within the next two years. The improvement projected and being carried out by the federal government calls for a channel 12 feet deep and 400 feet wide to the foot of Broadway, in Troy, and a channel 300 feet wide, but of the same depth, to the State Dam, at the head of navigation. The contracts for this work, let in 1893, cover the removal of 4,620,000 cubic yards of earth and 190,000 tons of rock, and the building of 8 miles of dikes. The estimated cost is $2,500,000.

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A COMBINATION DEVICE FOR THE POCKET.

In the accompanying illustration is represented a device, in form resembling a fountain pen, but containing a variety of useful articles besides the ordinary pen and pencil. It has been patented by Fred. W. Bacho, of No. 53 Conti Street, Mobile, Ala. The pencil and penholder slide in and out of the tubular body in the usual way, and a rotary spindle carries a tape extending through a slot, the tape having on it a calendar, foot measure, reference tables, and advertising matter if desired, both sides of the tape being thus utilized. A reversible rubber eraser is held in the outer end of the device, and near this end of the body portion are longitudinal pockets in which may be carried a toothpick, ear cleaner and nail cleaner, as shown in the small figures. Reversibly fitted to the other end of the device by means of a coupling collar is a block having a whistle at one end and a knife at the other end. All the parts are so assembled that they can be readily placed in position for use, and in practice the whole device need be only about the size of an ordinary fountain pen.

BACHO'S "POCKET COMPANION."

Cogwheel Railways.

The Temps publishes some interesting particulars with regard to the number and length of cogwheel railways, stating that 70 lines have been built since 1812, and that of these, 17 are in Switzerland, 14 in Germany, 12 in Austria-Hungary, 4 in France, and 3 in Italy, the others being in England, Spain, Greece, Portugal, the United States, South America, Asia and Australia. The total length of these lines is 500 miles, of which 188 are on the Abt system. These lines are worked by 300 locomotives, the heaviest of which weighs 70 tons.

THE RIVETT LATHE.

Nothing delights the heart of the true mechanic more than the examination of a perfect lathe, unless, indeed, it may be the actual possession of one. There are other machines more wonderful, and capable of performing intricate work, and imitating manual operations with remarkable fidelity and great rapidity. But for the lathe, such machines could not exist. The lathe may, therefore, be regarded as the progenitor of all machines. Having a perfect lathe, the machinist can produce anything required in the line of machinery or tools.

As every skilled mechanic knows, there is a vast difference in lathes. Some machines of that name are scarcely suitable for drilling a hole, while others are adapted to the very finest work.

A lathe of the latter class is here illustrated. It is known as the Rivett precision lathe, made by the Faneuil Watch Tool Company, of 474 Washington St., Boston, Mass., under patents of Edward Rivett. This lathe is designed for engineers, tool makers, scientists, electricians, machinists, and model makers.

It was built in response to the demand for an absolutely accurate lathe of small size, but capable of heavy work and having all the conveniences of the larger engine lathes, and these points have been faithfully carried out, and various advantages found on no other lathe have been secured. The lathe has automatic long and cross feed, with compound rest, rotary tool post, which is graduated, as are all the other rotary parts, and is furnished with an eccentric elevating device for the tool holder. The carriage has an automatic release from feed, and the compound slide rest is detachable from the carriage by the simple movement of one lever, leaving the carriage free to support the various attachments which may be used upon it.

The tools used in this lathe are made from round steel, and fit the tool post closely, enabling tools to be removed from the post, ground and replaced in precisely the same position with regard to the work that they originally occupied.

The lathe bed is very heavy, with the V's on the side, removed from chips and dirt, and the feed rod and lead screw are likewise on the side between the V's and also protected.

The slide rest is made to attach to a revolving tail stock for milling cutters and work of this description, the form to be milled being held in the tool post, the working cutter being rigidly and steadily held in the live spindle.

The traverse miller consists of a heavily built milling head mounted in a turret and fitting on the lathe carriage, being there secured by the simple lever movement characteristic of all the lathe parts, and when so mounted the lathe becomes a milling machine for all descriptions of tap, reamer, grooving, channeling and fluting work, cutting keyways as fine as a cutter can be made to stand the wear, or up to the size of a three inch shaft.

The turret raises and lowers the spindle, and also swings to any angle, enabling spiral work to be done with great facility.

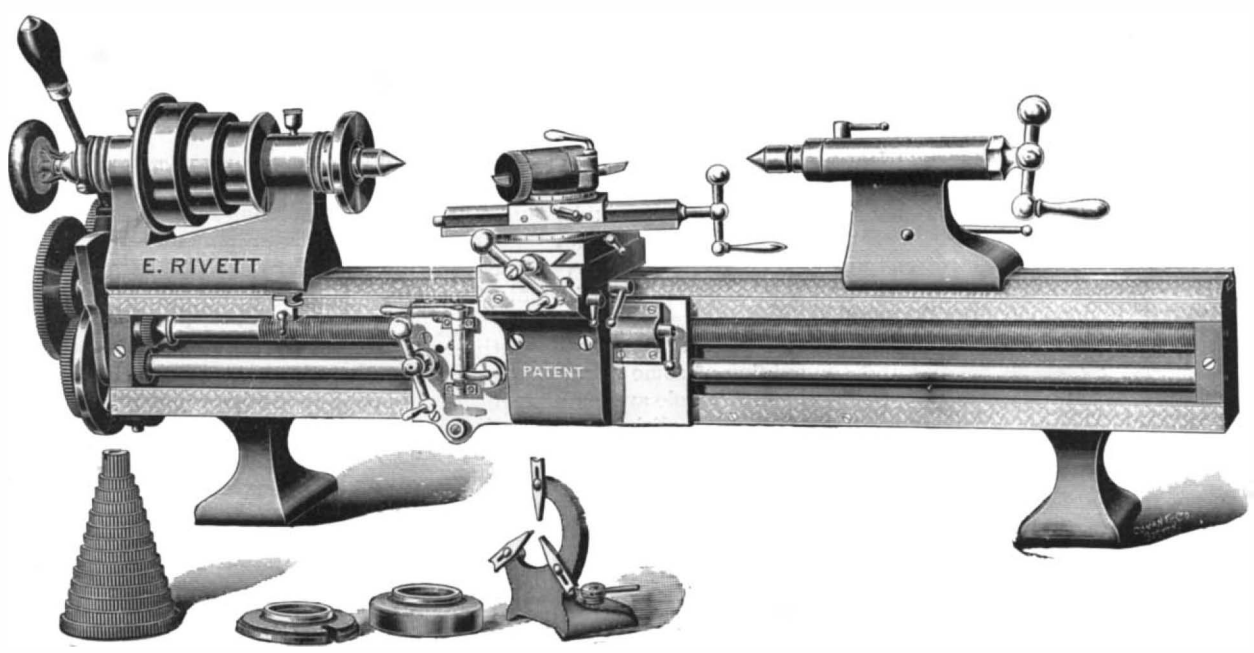
A slotting attachment, consisting of a small shaper head, is mounted on the cross slide of the lathe. It is very useful to all mechanics having small internal slotting, keyseating and work of this description to do. With this attachment any keyway may be put in a hole, from three inches to the smallest, in a very short time, the time depending upon the kind of metal being worked.

The lathe is also furnished attachments by which it is converted into a screw machine of the first order, having the latest and best drawing-in bar, diamond ground split chucks, six hole turret, cut-off and forming slide, and all that is found in the regular commercial screw machines.

There is also a taper screw cutting attachment, by which any taper may be turned and threaded, up to an angle of sixty degrees. This taper attachment uses the same change gears as the regular lead screw of the lathe.

Besides the above, the lathe is fitted with a grinder for internal and external grinding and diamond lapping, and a traverse grinder to grind up reamers from the traverse milling head following the work of the traverse milling cutter.

Accuracy has been the aim of Mr. Rivett. The lathe is finished in all parts with the most scrupulous care, the work of the scraper and diamond being everywhere shown. The bearings are of hardened steel. All surfaces and fittings are polished and scraped, no paint being used.



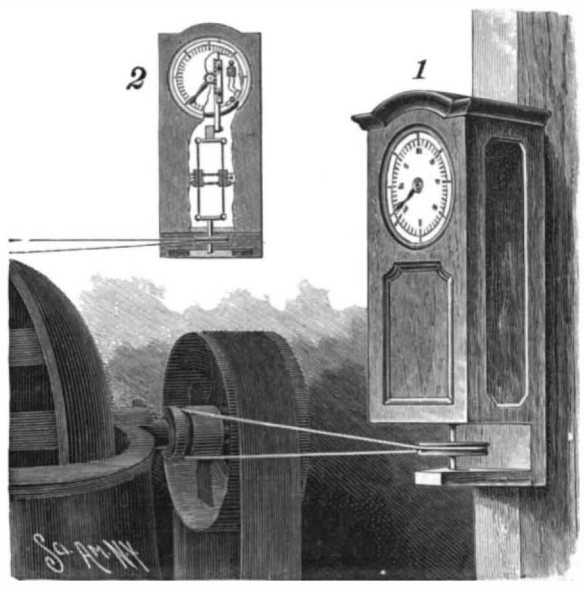
EIGHT INCH PRECISION LATHE.

Printed Copies of Patents.

Early this month the House of Representatives passed a bill (House bill No. 6,195) which is intended to reduce the highest price the Commissioner of Patents may ask for printed copies of patents from fifty cents to ten cents. Should the bill become a law as expected, the cost of copies of patents will be very much less than formerly. Such a result is greatly to be desired, inasmuch as it will enable attorneys or inventors, in making investigations, to secure a large number of copies in given lines at moderate cost, and at the same time help reduce the great stock of printed copies on hand in the Patent Office. How fast copies accumulate there can be imagined when it is stated that on the average one hundred and two copies of each patent are printed. Regarding the probable effect of the bill the Commissioner of patents thinks that it will take out of the office a considerable amount of material which might better be in the hands of the public, since much useful information would thereby be disseminated as regards the industrial arts, while the receipts of the government from this source are likely to be materially increased.

A NEW SPEED MEASURE AND ALARM.

A means of indicating the speed of a desired revolving part, and sounding an alarm when an excessive speed is reached, is shown in the engraving, and has been patented by Gustavus E. Kastengren, of No. 400 Bay Street, San Francisco, Cal. It is designed for vessels, cars, and other vehicles, as well as engines, dynamos and machinery, and has also been adapted for marine use, on both steam and sailing vessels. Fig. 1 illustrates the application of the improvement, Fig. 2 being a front elevation, partly in section. On



KASTENGREN'S SPEED MEASURE AND ALARM.

the upper end of a short shaft connected by belt with the revolving part whose speed is to be indicated is a cross piece forming part of a weight governor, the cross piece being pivotally connected at its ends by two spring bands with the ends of an upper arm, rotating loosely on a pivot pin on the lower end of a rack sliding in bearings in the casing. Weights are adjustably held by set screws on the spring bands, opposite weights being connected by coiled springs, and as the weights are moved outward by centrifugal force when the governor is actuated the rack is pulled downward, moving a pinion in mesh with it on a shaft carrying a pointer indicating on a graduated dial. On the shaft is also a second indicating wheel, serving likewise as a fly wheel, this wheel being marked on its peripheral surface, and its graduations being read through a glass in the top of the casing. An adjustable bar on the rack is adapted to move in contact with a spring by which, when excessive speed is attained by the revolving part, a lever will be swung to make contact with contact plates connecting a battery with an alarm, whereby an alarm will be sounded. In adapting the device for marine use, a screw propeller such as is used in connection with the patent log may be connected by a practically non-torsional metallic cord to the governor, when the rate of speed will be constantly indicated.

Otto of Rose Industry.

In 1890 the rose plantations in Eastern Roumelia covered an area of 2,698 hectares, or 6,664 acres, the yield in that year being 4,167 kilos. of otto, or only about 3¼ pounds per acre. The existence of the plantations seems to be compromised by the fall which the prices of the essence are yearly experiencing. The majority of the growers are so much discouraged with it that some of them intend to retire from the industry altogether.

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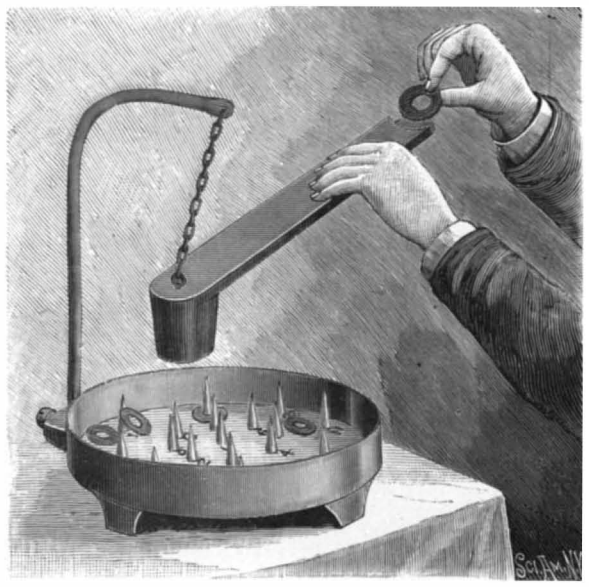
A NOVEL GAME BOARD.

The improved game apparatus shown in the accompanying illustration has been patented by J. W. Blackham, of No. 100 Schermerhorn Street, Brooklyn, N. Y. In its base portion are arranged numbered pegs, above which is flexibly suspended a chute, having at its lower end an angularly disposed delivery



BLACKHAM'S GAME APPARATUS.

spout. Secured to one side of the base by a set screw is a post, from an arm of which the chute is suspended by a chain. Different rules may be made for counting a game, to successfully play which the player must hold the chute in such position that the rings with which the game is played will be delivered onto the pegs, and not alongside of them.

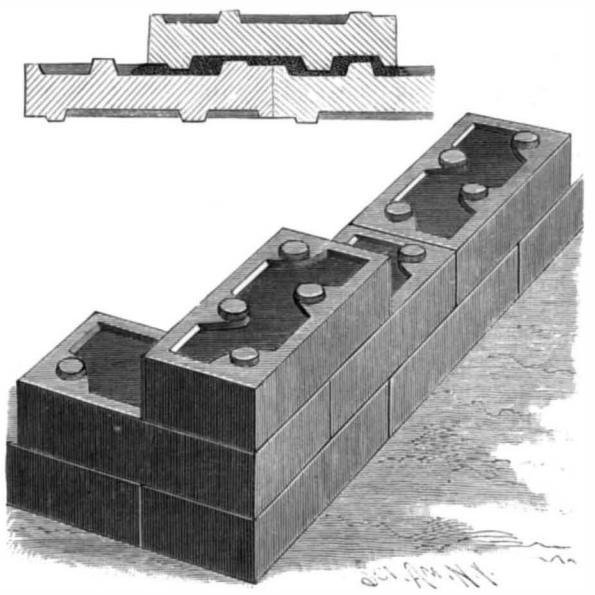
Where is the Best Butter Made?

A St. Paul, Minn., dairy company now claims to make the best butter in the world, having won the prize and first premium at the recent national butter and cheese convention at Cedar Rapids, Iowa, against more than 500 competitors, from Maine to California. The Minnesota butter scored 97·82 in a possible 100 per cent. The fine butter making industry has gradually worked toward the West. The center of production of the best dairy products in the United States was first established in Orange County, N. Y. Thence it took a long jump westward to Delaware County, Iowa, which for years maintained its prestige as a producer of the finest butter. Elgin, Ill., then captured the prizes and held the reputation, but now the glory and the prize, a $500 silver statue, are St. Paul's. The result is expected to operate as a great stimulus to careful and intelligent dairying in the Northwest.

INTERLOCKING BRICK.

The brick shown in the accompanying illustration, whether used in an outside wall or an inside partition, are designed to tie themselves together in such a way that the wall cannot be sprung outward nor cracked.

The improvement has been patented by Oscar Kleinberger, Nos. 411 to 415 North Eighth Street, Saint Louis, Mo., and is adapted to afford a very solid wall, as well as the best and strongest brick for arches, while a chimney built of this brick cannot crack. The engraving represents a portion of a corner of a wall in which these brick are used, the smaller figure showing a sectional view of bricks thus laid to break joints. Upon both the upper and lower faces of the brick are recesses and projections or nipples, the nipples being ordinarily made to extend a slight distance above the plane of the margin of the brick. In breaking joints, the nipples on one end of the under face of the upper brick come between the nipples on the end of the upper face of the lower brick, but there is sufficient space between the nipples to permit the bricks to be moved endwise or sidewise. The cement or mortar in which the bricks are laid may be as deep or as shallow as desired, for when even the margins of the brick are brought in contact there is sufficient quantity of the cementing material to form a firm tie.



KLEINBERGER'S BUILDING BRICK.

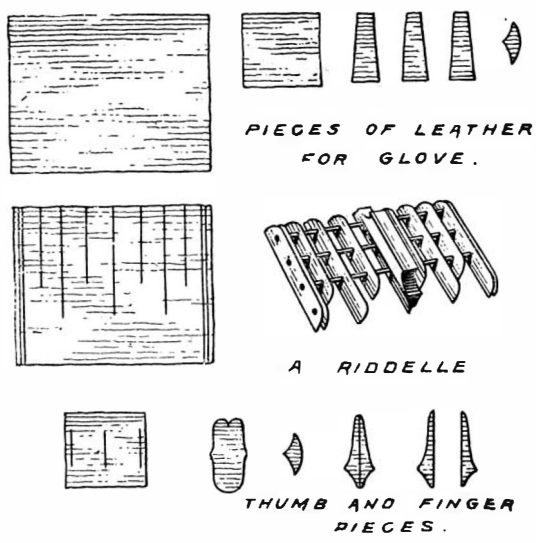
MANUFACTURE OF KID GLOVES.

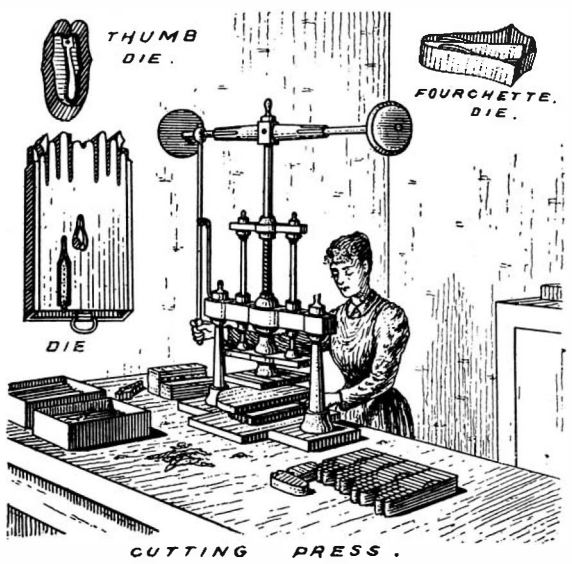
In our last issue we illustrated the various processes employed in the preparation of leather to be used in the manufacture of kid gloves. In the accompanying article and cuts we set forth the further steps in producing the finished article of an industry which is little understood by the general reader.

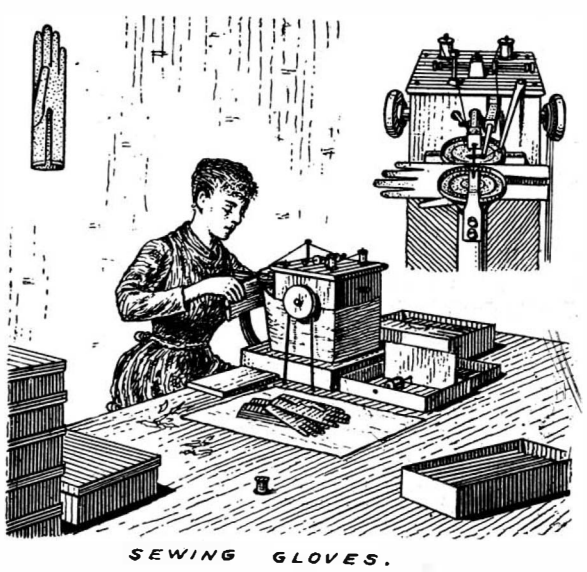
The leather used for gloves is manufactured from the skins of lambs and kids, the skins coming principally from Brazil, France, northern Italy, Germany and Switzerland. In Europe, where they raise the stock, the kids are allowed to roam about but very little, too much exercise tending to toughen the skins. The raw skins have to pass through a number of processes, such as washing, unhairing, fleshing, paddling, drenching, tawing, coloring, staking, etc., which makes the leather soft and pliable for working purposes. The skins from which ladies' gloves are made are taken from the kid when about five weeks old. For gentlemen's street gloves the skins are about two months old. The gloves mostly in use are the glacé, castor, and undressed kids. The glacé, or polished glove skin, is colored on the grain or hair side. The undressed kid is colored on the flesh side. The castor glove skin may be colored on either or both sides after the grain has been scraped off.

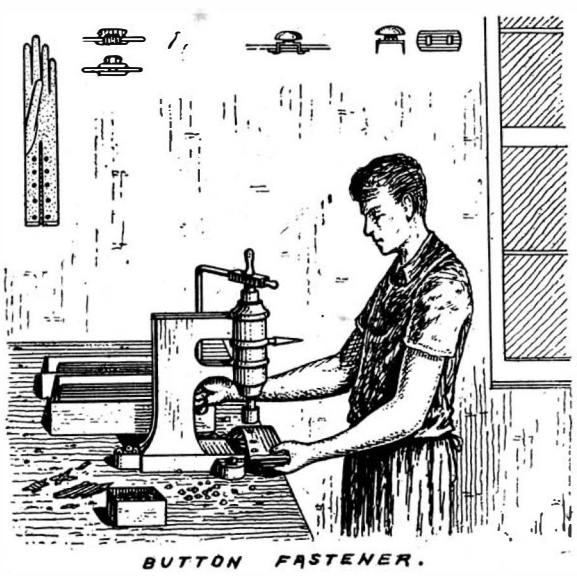
From 20 to 24 pairs of gloves can be manufactured from one dozen skins, including the pieces between the fingers, called fourchettes.

The prepared skins cost about $12 per dozen. The finished gloves for ladies range in size from 5½ inches to 7½ inches around the palm of the hand; for gentlemen, from 6¾ to 10 inches; and for misses, from 4½









MANUFACTURE OF KID GLOVES.

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to 6½ inches. The first operation in glove making is shaving, the object being to thin and soften the leather. The skin is first dampened and laid out perfectly flat on a black marble slab with the grain side down, an operator then taking a broad knife similar to a chisel, cutting and thinning the skin down to the proper thickness.

The knife or shaver used is about 8 inches in length and about 4 inches in width. During the shaving process a little flour is sprinkled on the skin to prevent the knife from slipping and making a bad or uneven cut. About six skins can be shaved per hour. After shaving the leather is stretched and then cut up by hand into glove parts the proper size, after which they are lined or riddelled. The riddelle is a stamp for marking lines on the glove pieces for forming the fingers, each size glove having a different stamp. The thumb pieces are marked in a similar manner. The spaces between the lines when marked are about double the width of the fingers, so that when the leather is stretched over the glove pattern the lines will draw closer together. The glove patterns are made of tough cardboard and range in size from 10¼ inches to 11½ inches in length and from 4½ inches to 5¼ inches in width. A separate thumb and fourchette pattern of the same material is also required for each size glove. A pattern is laid on a table and an operator places the lined end of the piece of leather on the finger end of the pattern, and with his hand stretches the leather until the spaces between the lines are of the same width as the fingers on the pattern beneath. The thumb and finger pieces are then done in the same manner. Each glove is then marked and the different parts, including a narrow strip for the top, is passed into the hands of an inspector, who looks them over thoroughly to see if there are any imperfections. After this inspection the parts are taken to the cutting presses. The dies used for cutting out the gloves are made of steel the proper shape and size. The section of the die for forming the glove is encircled by a sharp steel knife and is movable, it being connected on the under side to the bottom of the frame by means of a number of springs. Six pieces of the leather are first placed on top of the die, over which is laid a strip of paper. The die is then put in position in the press and a circular piece of rubber placed on top. The attendant, by pulling around the lever of the machine, forces an iron plate down on the rubber disk, which presses the leather against the sharp edge of the knife, causing it to cut through the material. The thumb pieces are cut in a similar press. About eight to ten pieces are placed on a thick piece of paper and placed in position in the press. The die is then placed on top of the pieces, bottom up. The lever is then turned around as before, the pressure of the plate against the die forcing the knife-like edge through the leather. About eight dozen pairs of gloves can be cut out per hour. The backs of the gloves are then embroidered by a machine, and the proper size and color of the fourchettes picked out to match the fingers. They are then laid inside of the folded glove, taken to the press, and the fourchettes cut out with a die. The die is made to cut out two fourchettes in one piece. They are cut out in the same manner as the thumb pieces.

The next operation is the sewing of the gloves together. The piece between the thumb is sewed on first, then the thumb and then the fourchettes, and so on. A narrow strip of binding is sewed on the inside to keep the leather from tearing out where the hook or buttons are placed. Sharp-pointed pincers are used to bring the parts together for sewing. The glove is sewed with an over-seam stitch. The glove is held in position by means of two circular pressers. These pressers revolve when the machine is in motion, causing the glove to move forward during the sewing operation. The silk threads, when carried through the glove by the needle, form a loop, a lever then holding the thread tight until a threaded hooker, which works back and forth across the needle, catches the loop. As soon as the hooker has the loop, the lever loosens the thread, the needle goes forward, the hooker drawing back, pulling the thread through and dropping the loop, which is drawn tight by a spring on top of the machine. After the gloves are sewed they are laid, for about ten minutes, in a damp cloth. The gloves are then flattened and pulled into shape by rubbing the hand over them on a smooth table. If there is any unevenness, a wooden roller is used to flatten them. About one dozen pairs per hour can be flattened out by a good hand. For giving black gloves a luster, a solution composed of neatsfoot oil, soap, vaseline and grease is rubbed on the surface by hand. Glacé gloves are polished on a plush covered wheel about 18 inches in length and about 12 inches in diameter.

The attendant places a stiff piece of cardboard on the inside of the glove and presses it against the wheel, the revolving of which, traveling at the rate of 350 revolutions per minute, gives the gloves a polished appearance. About six dozen are polished per hour. The gloves are then ready for the buttons or hooks. Holes are first made in the glove where the buttons or clasps are to go, by forcing through the leather a conical shaped instrument connected to the front of the machine. Eyelets are then inserted in the holes and hollow tops or clasps placed on top. The two parts are then pressed firmly together between two dies, by means of a lever drawn around by the attendant. The head of the clasp, as the upper die descends, passes into a circular hole in the bottom, preventing the top from being crushed. Both sides of the opening are done in the same manner. Two or more of these machines generally work together, the attendant of one making the holes and putting in the eyelets and the others stamping the parts together. About sixty of these fastenings can be made per hour. The sketches were taken from the plant of Foster, Paul & Company, Jersey City. From their plant in Grenoble, France, they turn out about 500 dozen pairs daily.

Women as Inventors.

An observing woman, a few years ago, saw the necessity of improving the ordinary buckle used on hose supporters and the like, and succeeded in producing an article which prevented scratching and otherwise injuring the body and tearing the clothing. After she had protected her rights by obtaining a patent, she did not look around and wait for a purchaser of it, but bent her energies to manufacturing and introducing the article. From small beginnings she has now a well equipped factory with a force of five hundred employes, and is hardly able to fill the orders she steadily receives from the largest wholesale houses.

If it be true that "what man hath done man can do," a precisely similar remark is no less applicable to woman, and the number of women to whom the way of practical success in life stands open, as really as in the case we have above recorded, is almost unlimited. There are, it is true, avenues of invention which seem more appropriately to belong to men, although in most cases this is only a surface view of the matter, but see how very large is the field in which it may be said that women have really the superior claim, the pre-empted right, as it were, to be much the more numerous inventors. In all that pertains to household economy, in the preparation of food, the beautifying and making comfortable the home, the providing of the wearing apparel and the bringing up of children, her sphere is by far the most active, practical and influential, and her wit and discernment should, therefore, in such lines, be quicker to apprehend and keener to discern improvements likely to be of advantage, and possessing also possibilities of bringing pecuniary reward.

According to an abstract we published a few weeks ago, it appears that there have been 7,663 patents issued on laundry appliances; 4,389 on different kinds of chairs, and 4,854 on furniture other than chairs; 2,103 on knives, forks and spoons; 3,184 on scrubbing brushes and brooms; 1,747 on kitchen ware, and 2,005 for devices for use in cutting and preparing vegetables; 4,453 on games and toys; 175 on different varieties of needles and pins; 11,795 on buckles, buttons and fastenings for clothes; 5,014 on beds and lounges; 2,435 on window shades; 1,541 on making preserves, and 1 506 on crinolines and corsets, besides great numbers of others which appeal to women directly as customers or are dependent solely upon the judgment of women for their success or failure. If we concede, then, that there are some departments which more naturally attract the inventive genius of men, as the improvement of farm implements, the building of engines and machinery, etc., is it not just as true that the inventive faculties of women would seem to be equally adapted to devise improvements in the specialties we have noted? In the line of new inventions and discoveries, notwithstanding all that has been already achieved, there are, without doubt, as many brilliant successes lying before the inventors of the future as have been credited to the inventors of the past. The way is open to all.

GALVANIC ETCHING.—A process for etching letters, names, or designs on metallic goods, such as knives, for instance, is described in the Zeit. f. Electrochem. The objects are covered with the following mixture: One liter of naphtha, ⅛ kg. of carbon bisulphide, 2 kg. of pulverized resin, and 1·5 kg. of chloride of copper. After covering with a thin layer of this, the stencil or type is washed with a weak solution of potash and pressed on the surface, which is then washed, after which it is wet with a weak solution of sal-ammoniac through which a current is passed, which then etches the metal where the insulating coat has been removed.—Electrical World.

IN a recent opinion of the Michigan Supreme Court it is held that when an author places his book before the public he invites criticism, and however hostile that criticism might be, and however much damage it might cause him, the critic was not liable in an action for libel, if he made no misstatement of any material facts contained in the book and did not attack the character of the author.

Science Notes.

Fish with Sand Ballast.—A highly original observation upon the behavior of fish in deep water is attributed to a long experienced captain of a steam fishing smack, so remarkable as to deserve special notice. The fishing boats belonging to the southern portions of the North Sea found in their catch, lately, a disproportionately small quantity of codfish. The captain maintained that he had foreseen this for eight days, because most of the fish caught had sand in their stomachs. He claims to have often observed that just before the fish left the shallow water of the southern banks, they took sand into their stomachs, and soon after fish caught in deeper northern waters showed the same peculiarity. Then when the time for migrating from these deep waters came again, the fish disposed of the sand. The theory has been advanced that the sand is taken in as ballast, and is rejected when shallow water is to be returned to. The sand often differs in color and grain from that of the bottom where the fish are found. It is claimed that this sand may supply a guide for the fishermen.—Hansa.

A Metal Bird's Nest.—There is said to be a metal bird's nest in the Museum of Soleure, Switzerland, which is made entirely of steel. Soleure has a number of clock factories, and broken springs are often thrown out in the yards. One day a man noticed a peculiar looking nest in a tree in his yard. He found on examination that a pair of wagtails had built a nest almost entirely of clock springs. The nest was four inches in diameter. After the birds had reared their brood it was taken to the museum.

The danger of liquefied acetylene gas is considerable, for if it is stored in a steel cylinder at six to seven hundred pounds pressure, in the event of a fire breaking out in a building containing it, it would be decomposed, forming carbon and hydrogen; the latter would have a pressure of 20,000 pounds per square inch, which would burst the cylinder and cause widespread damage. Even a slight leak in the cylinder would be very dangerous, for three or four per cent of the gas in the air would cause a violently explosive mixture. Acetylene gas can also be exploded by fulminate of mercury, and the gas also makes explosive compounds in coming in contact with copper.

In the new edition of the British Pharmacopœia, the metric system of weights and measures will be adopted.

Several hundred persons attended the unveiling, on March 8, of a memorial tablet that has been erected on the site of the villa at Passy, near Paris, which was occupied by Benjamin Franklin from 1775 to 1785. It was at this villa that Franklin erected his first lightning conductor. The dramatist, M. Manuel, president of the Passy Historical Society, presented the tablet, and M. Faye, a member of the French Academy, spoke of Franklin's scientific researches. The Hon. J. B. Eustis, the American ambassador, acknowledged the gift of the tablet.

Herr Wilckens, of Vienna, has found that two full-blooded English horses transmitted the color of their coats to their offspring in 586 cases out of 1,000. Where the parents were of different colors, he found the hair of the foals, in most cases, took the color of that of the mother.

The Cocopah volcanoes, seventy-five miles southwest of Yuma, Arizona, were in violent eruption a short time ago. The larger ones were emitting great volumes of smoke and some flames, and the smaller ones were throwing out quantities of water, stones, and mud. The noise of the eruptions could be heard at a long distance.

A short time before he died Dr. Charcot stated, in a lecture, that semi-scientists had for more than fifty years ridiculed the idea that the full moon is a dangerous time for insane persons. Dr. Charcot stated that scientists were now going back to the old-time notion, as a result of increased learning on the subject of earth tides, which are similar to the oscillation of sea tides.

A shower of dust fell on the ship Scottish Dales, when she was far out at sea in the Pacific Ocean, off the coast of the Argentine Republic. The captain states that the dust was very fine and of a light buff color. As the dust storm blew toward the ship, it looked very much like snow. The dust fell in considerable quantities upon the deck and rigging. It is supposed it came from some volcano in active eruption.

The entomological collection of M. Jules Fallon, which includes twenty-five thousand moths and butterflies, has been presented to the museum of the Jardin des Plantes, at Paris, by his grandsons.

By a special permit, and in mailing packages approved by the Post Office Department, bacteria or disease tissues may now be sent through the mails to United States or municipal laboratories.

An agitation has been started by a number of scientists urging the appointment of a permanent director-in-chief of the scientific bureaus and investigations conducted under the charge of the United States Department of Agriculture, this officer to be a broadly educated and experienced scientific administrative officer, who would not be at the mercy of politics, but who should hold office during good behavior.

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THE GORGE ROAD AT NIAGARA FALLS.

(Continued from first page.)

A mass of water will be seen forming a wave whose contour will hardly change. In the illustration the long descent of the road is shown and the car is seen entering upon its course through the gorge. At this point the line is comparatively straight.

Visitors to Niagara will remember the somewhat confusing number of elevators by which the rapids were reached from the vicinity of the Suspension Bridge. Now the elevators have been stopped, with the exception of one, which will probably be maintained in operation for some time to come. Our view is taken near the foot of this, the Buttery elevator.

For about a mile the rapids continue, when the river opens up and bends to the right, forming on the left a species of bay, into which the waters penetrate with a slow rotary motion, forming the celebrated whirlpool. The view at this point is peculiarly attractive. The cliffs rise some two or three hundred feet and are darkly wooded, and the winding course of the road along the bank opposite the whirlpool gives a charming prospect. Without losing interest, the view now becomes more quiet, the river in its lower rapids being at least comparatively tranquil. A short distance below the whirlpool a monumental shaped rock stands on the outer side of the track, a conspicuous object, termed Giant Rock. On the right of the road is the Devil's Hole, a cave and gorge which was seen by La Salle in 1678, and which on September 14, 1763, was the scene of a fearful massacre of a company of English soldiers by the Seneca Indians. During the construction of the road relics of the massacre—bayonets, buttons and equipments—were found in considerable number.

As Lewiston is approached the cars pass under the ruins of the old suspension bridge, the first one that ever spanned the river, and, in its day, the largest in the world. It was begun in 1848 and finished in 1850. In 1863 it was wrecked, and its ruins have ever since remained in partial suspension above the now placid waters of the river.

The entire length of the road, from Niagara Falls to Lewiston, is about 7 miles. Each car has two 50 horse power Westinghouse motors and electric heaters. The power is now supplied by the Niagara Falls Hydraulic Power and Manufacturing Company, utilizing the water from the Schellkopf surface canal, at 210 feet head. Two Westinghouse 50 horse power generators supply the current at 500 volts potential. The line is laid with 60 lb. steel rails, double tracked throughout, with trolley wire of 00 gage. With the exception of the descent from the high land to the river, the maximum grade is 1¼ per cent. Among the possibilities for the future the generation of power for the road by a current motor has been suggested. The road is operated under the superintendence of Mr. J. R. Brooks. The chief engineer is Mr. G. H. Ricker.

A Proposed New Ship Canal.

A bill is before Congress to incorporate the Maritime Canal Company of North America, and providing for the construction of a ship channel not less that 26 feet in depth and 300 feet in width, from Lake Erie to Lake Ontario, and from Lake Ontario or the St. Lawrence River to Lake Champlain, and thence to tide water in the Hudson River. The company asking the charter is said to have been at work for three years on the project, owns a valuable franchise for a ship canal from Lake Erie to the ocean, via Montreal, has spent over $200,000 in surveys and preliminary work, and owns the patents on the great Dutton pneumatic locks, the first of which is now going in at Lockport, on the Erie Canal, to take the place, in one lift, of all the locks at that point.

It is said that the promoters have found that the route from Lake Ontario down the St. Lawrence, nearly to the forty-fifth parallel, and thence to Lake Champlain, all on American soil, is entirely feasible, and, using the pneumatic lock, can be constructed for about 60 per cent of the estimates hitherto made for other plans of getting down to the level of the Hudson River.

The charter provides that for all its canals, locks, and works there shall never be issued more than $200.000,000 of bonds, preferred stock, and debentures; that no more than 5 per cent shall be paid thereon, but that tolls shall be steadily reduced so as to keep the dividends and payments within that sum; that work shall commence within three and be completed within ten years, and that its terms having been complied with, the instrument shall continue in force forever, unless the property shall be assumed by the government for the free use of the public.

American Men of Science Honored.

Emperor William and the Empress were present January 5 at the celebration of the centenary of the Institute. The American professors Simon Newcomb, Alexander Agassiz and Henry A. Rowland were created officers and Adolphus Hall a chevalier of the Legion. All are corresponding members of the Academy of Sciences.

Correspondence.

Gluing Belts.

To the Editor of the SCIENTIFIC AMERICAN:

In the SCIENTIFIC AMERICAN of February 1, 1896, is an article on "Glue Joints in Belts."

I heartily agree with your correspondent in regard to rivets being a nuisance and of no use whatever in a properly glued belt.

I have glued a great many belts for the last thirteen years, and, to my mind, it is the only proper way to join a belt.

In the room that I have charge of there are eighteen machines (wood working), and for the past seven years there has not been bought or used a single hide of string leather and but a few papers of belt hooks.

We keep three or four belts of different widths to hook on, if a belt breaks on a machine that cannot be spared long enough for glue to dry, and then about night glue on the belt that belongs on and let it dry overnight, and it is ready to use in the morning. If we wish to take up or tighten a belt, we do it just before night and let it dry overnight.

A good quality of common glue is just as good as any cement you can make, and, if properly done, will last for months, and sometimes many years, and can hardly be got apart to tighten.

I have used them on tenoning machines where hooks or string lacing would not last but a few days, but the glue joint would wear several months.

Our modus operandi is this: Allow about eight inches for lap, smooth with a plane each end, or scarf off with a scraper until the lap would be the same thickness as the rest of belt and then roughen the surface with an old hand saw, or some similar tool, so the glue will take hold of the fiber or grain of the leather; then take a piece of board two feet long with straight edge, and nail each end of belt to board nails near the end of board, so that lap comes about the middle and edge of belt on straight edge of board, to keep the belt straight. Put a piece of paper between board and belt to keep belt from sticking to board by surplus glue. Apply thin hot glue (well cooked) to both surfaces that come together and be quick about it, so glue won't get cold, rubbing and pounding out all surplus glue until well stuck down, and let stand until morning. Then take it off board and trim, and it is ready for use.

If a belt is greasy, take ammonia water and rub lap with that and let it dry before gluing.

A belt put together this way will run smooth and draw steady and does not pound out the Babbitt boxes as lacing and hooking does, and, under all ordinary usage, will last longer than any other joint I know of.

Your paper is a welcome weekly visitor at my house. I have taken it for about twenty years.

Oswego, N. Y. B. M. GUNSTON.

Cause of Variation in the Velocity of Wind.

To the Editor of the SCIENTIFIC AMERICAN:

I wish, if possible, you would answer me the following questions. Being somewhat interested in meteorological observations, I would like to know the causes of the following: We have a storm, wind blows northeast brisk to high. As storm travels on over, wind comes out of northwest; weather clears. Now, northwest wind blows a gale all day, and when night comes wind falls with the sun, and does not blow through night more than five or six miles; but when sun rises the wind also rises, and blows a gale once more, and will act this way for three or four days. Now, if the storm continues which is still traveling north of us, why don't wind gradually decrease? Why does wind blow high in day, not at night? C. L. H.

Long Branch, N. J.

[Answer by the U. S. Weather Bureau: In reply to your letter of the 11th instant requesting an explanation of the fact observed by your Long Branch correspondent, I have the honor to inform you as follows:

On land surfaces at sea level the wind attains its greatest velocity during the heated portion of the day—from 10 a. m. to 2 p. m.—and then diminishes in velocity until the minimum is reached about midnight. This condition does not prevail, however, at an elevation of 4.000 feet and upward, as has been conclusively shown by direct observations of the velocity of the wind on mountain peaks, and also of cloud motions in the free air. The maximum velocity of the wind at Pike's Peak, Colorado, elevation 14,134 feet, occurs from 2 to 4 a. m. and the minimum from 11 a.m. to 1 p. m. The decrease in the velocity of horizontal currents at a considerable elevation during the warmer hours of the day is ascribed to the interference of ascensional currents set in motion by the insolation of day time; and the greater the inertia of these ascending columns, the greater will be the frictional resistance to the steady motion of the horizontal currents. It also follows that when the upward motion of the lower warmed air is greatest, the surface velocity is also at its maximum, being the effect of the observed surface barometric gradient and the interchange of the faster moving upper currents with the surface currents. On the other hand, when the effect of the sun's rays is no longer felt and the surface air begins to cool by radiation, there is more or less stagnation in the surface air, although the upper currents move with slightly increased velocity.

WILLIS L. MOORE, Chief of Bureau.]

Electric Light Dangers.

London oculists are up in arms against the very serious danger to the community caused by the electric light. Several eminent eye doctors are agreed on the point that unless a stop is put to the exposure of uncovered electric lights in the streets and in shops and offices nearly all the population will become blind. Experts are so greatly exercised in the matter that they even suggest that Parliament should take it up, and prohibit the use of plain glass globes for electric lights unless they are properly shaded

Commenting on this, a London electrical journal says: "It is not customary to look at the sun, and not even the most enthusiastic electrician would suggest that naked arcs and incandescent filaments were objects to be gazed at without limit. But naked arc lights are not usually placed so as to come within the line of sight, and when they do so accidentally, whatever may result, the injury to the eye is quite perceptible. The filament of a glow lamp, on the other hand, is most likely to meet the eye, but a frosted bulb is an extremely simple and common way of entirely getting over that difficulty. The whole trouble can be easily remedied by the use of properly frosted or colored glass globes. In any case, however, the actual permanent injury to the eye by the glowing filament is no greater than that due to an ordinary gas flame."

The Demolition of a Large Mill Chimney.

The Engineer of recent date contains an interesting description of the demolition of a chimney at Manchester, England. The chimney was 270 feet in height; each of the eight sides of it were 11 feet 4 inches wide. The chimney had a taper of ⅝ of an inch to the yard. The foundations were nearly 25 feet deep, and over 1,100,000 brick were used in the construction of the chimney, which was 28 years old. The estimated weight was 4,000 tons. The owners of the chimney having sold the property, it became necessary to remove it, and it was bought as old building material.

There was an inside brick lining to the chimney, and the inner and outer walls were tied together by eight midfeathers. There was a lean of over 2 feet, in a northerly direction, still it was not considered that it was unsafe. The purchasers of the chimney engaged an experienced rigger to raze it. He caused a portion of the base on five sides (east, south and west) to be cut away for 5 feet 6 inches in height, and as the cutting away of the brickwork proceeded, timber lintels or carriers were inserted, wedges being used to pack up the bricks, which was a difficult operation, considering that the thickness was 7 feet 6 inches. The timbers were perforated for the reception of resin and other inflammable substances to insure quick combustion. When this work was completed, the spaces between the uprights were filled with shavings, pieces of wood, coal tar, pitch, etc., and over this was poured a considerable quantity of creosote and paraffine oil. On the afternoon of February 13, in the presence of thousands of spectators, a light was applied to the inflammable material. Large bodies of flame shot up and smoke poured out of the top of the chimney and from cracks in it. The fire continued with great fury and was fed in places where it was desired to more quickly destroy the timber, with paraffine oil. The stack leaned over to the south and had not gone far out of the perpendicular when the portion near the base dropped into itself, and the support being thus removed the remainder of the structure literally collapsed in telescopic form and fell in a southerly direction. The debris covered an area 75 feet long by 40 feet wide. The time occupied in the destruction of the timber supports, that is, the time of the lighting of the timber to the fall, was only seven minutes. Little noise was heard when the stack was falling, but a considerable shock was experienced when the heavy mass fell on the ground. Two tons of coal, a barrel of creosote, 2 barrels of paraffine oil and 350 cubic feet of timber were used in the destruction of the chimney. The result of this method of demolishing the chimney is regarded as very satisfactory.

HORSE POWER OF A LIGHTNING STROKE.—At Klausthal, in Germany, according to Machinery, a lightning stroke struck the wooden post of a house, and fused two nails four millimeters thick. Messrs. Siemens & Halske, of Berlin, afterward carried on a series of experiments to ascertain the force required to melt this quantity of iron. Assuming one second as the time standard, it required a current of 200 amperes and 20,000 volts, representing 7,000 horse power. Assuming that the lightning occupied one-tenth of a second to fuse the two nails, the horse power required would be 70,000.

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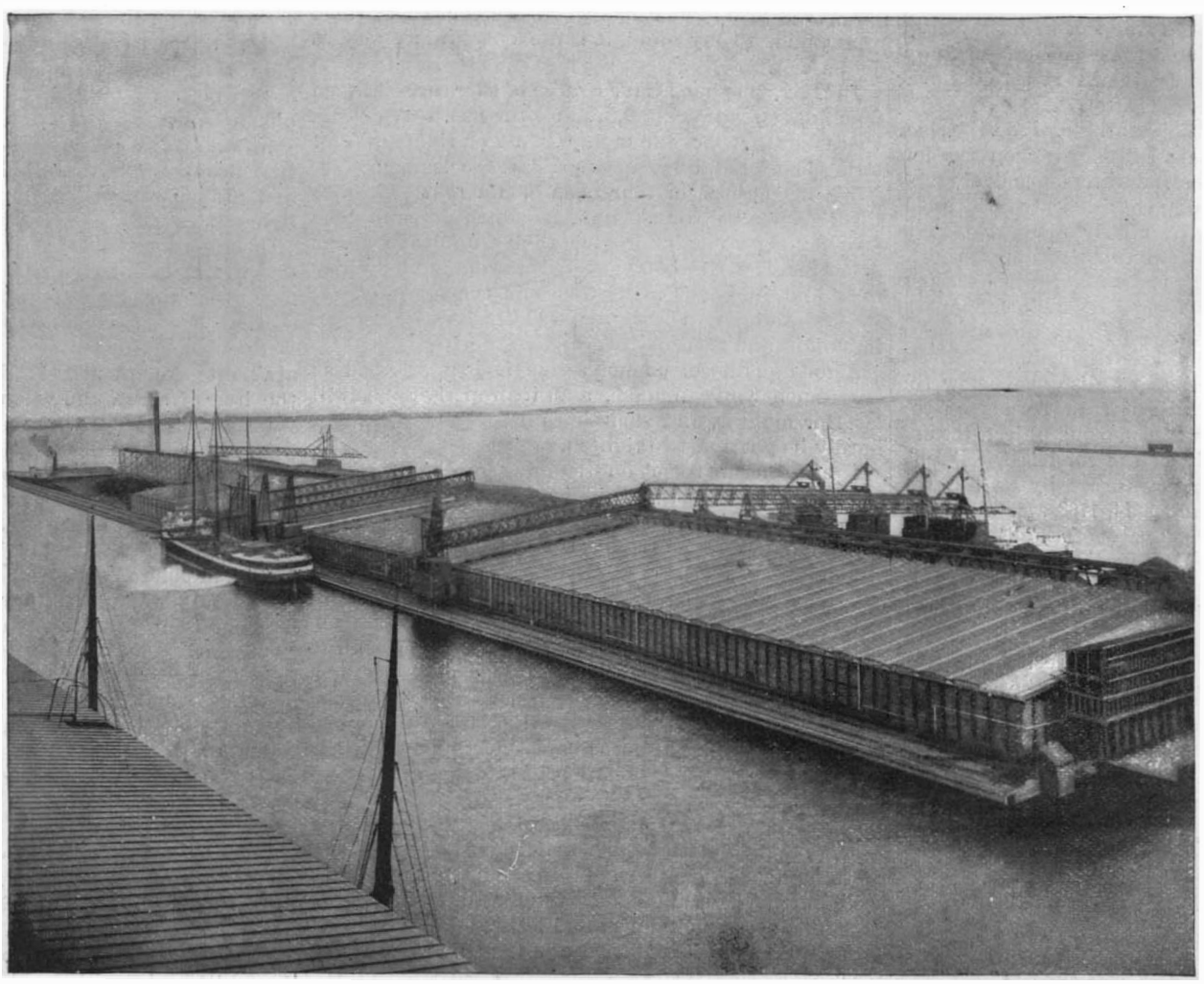
A GREAT COAL DOCK ON LAKE SUPERIOR.

At Rice's Point, opposite the entrance of the harbor at Duluth, Minn., is a coal dock of great size, of the Ohio Coal Company, which has recently been newly equipped throughout with the most improved appliances for handling coal. The dock is 1,560 feet long and 300 feet wide, a double railway track extending through its center. It has a shed 950 by 150 feet, with watertight roof, for housing all the anthracite coal received, and the daily unloading capacity is 4,000 tons, the coal being handled by the Newell & Ladd self-filling or clam shell buckets, made specially heavy for digging soft lump coal, while the carriages by which the loaded buckets are conveyed from the dock front to the pockets in the center—150 feet—or dumped at any intermediate point, were made by W. S. Boyle & Company, of Chicago. One of our illustrations represents the entire dock from the side on which is the storage shed, the other view, looking the other way, showing the steel trestle and trusses. The steel work was designed by E. H. Hilgard, engineer of bridges of the Northern Pacific Railroad, and is a rebuilding in steel of the facilities with which the dock-yard was equipped in 1882, which are claimed to be more economical in practice than newer designs whose introduction has been advocated.

There are ten 60 horse power Mundy engines, and five 100 horse power boilers, anthracite dust being used as fuel and steam being furnished to the movable towers along each side of the dock by an 8 inch pipe, 3,500 feet long, provided with 125 openings, permitting the making of connection with the main pipe at almost any point where it is necessary to place the hoisting rig. The whole equipment is deemed especially advantageous for the handling of big lump coal, which has heretofore been done by hand labor only.

The Ohio Coal Company also has extensive docks at West Superior and Ashland, Wis., and handles nearly 500,000 tons of coal annually. It is the exclusive representative on Lake Superior of the Pennsylvania Coal Company, handling their Pittston coal, and is also the exclusive representative of the Delaware & Hudson Canal Company in the handling and sale of the Lackawanna coal, being also interested in soft coal mines in Pennsylvania and Ohio, from which it receives coal for consumption in the Northwest.



A GREAT COAL DOCK AT DULUTH, MINN.—STORAGE CAPACITY 250 000 TONS.

STEEL TRUSS CONVEYORS OF A GREAT COAL DOCK—NO HAND LABOR REQUIRED.

As fresh flowers and window plants are expensive and difficult to raise, a substitute may be obtained by the following process: Squeeze an old sponge out of warm water and drop into the holes a variety of such seeds as will germinate easily—"mixed bird seed" is very suitable for the purpose—and hang up in the warmest and best lighted situation. Sprinkle with water daily, and soon the sponge will be completely hidden by drooping vegetation.

The Solar Corona Photographed in Daylight—Chief Characteristic of the Corona.

From innumerable experiments made during the last six months it has been found that metallic plates, foils and films are relatively transparent to solar radiance of high refrangibility, and that photographic plates screened by such media during exposure to direct sunlight are affected in proportion to the thinness and celestial conductivity of the interposed screen.

This important discovery has been successfully employed in photographing the solar corona. The results obtained are so remarkable and the recorded changes so great and rapid that great caution had to be exercised till a sufficient mass of confirmatory evidence could be obtained to justify this announcement. The photographs secured range from 1895, July 3 to December 15, on which latter date comet Perrine is also shown very close to its calculated place.

The earlier photographs were principally taken with a camera of 4 in. aperture, the metallic screens employed being tin and lead foil and sheet copper. Prominent equatorial extensions over the regions of active sunspot groups are the chief features of these pictures.

An immense advance was made by the introduction of a small clear aperture (pin hole) in place of the camera lens. As was expected, a far greater mass of detail, more sharply definite and exhibiting a considerably greater extension of corona, was obtained by this method. Generally three or four exposures by both methods and through different media were obtained on the same date, and the more prominent details invariably found to agree; a proof of the objective reality of the phenomena.

A preliminary discussion of the photographs seemed to disclose the following characteristics:

1. A very close and intimate connection with contemporary sunspots and sunspot groups—active sunspots, especially when near the sun's limb, indicated by enormous radiations over the particular region of activity. It may be regarded as an axiom that "every sunspot has its coronal ray," as every prominent radiation may be easily assigned to its particular spot to which it invariably points.

2. That the well known typical spot maximum and spot minimum coronal phases alternate pretty rapidly, apparently synchronizing with observed phases of short period spot activity and quiescence.

3. That many of the most prominent radiations exhibit a decided helical structure, two or three convolutions, in some instances, being distinctly traceable—a surprising and unexpected feature.

4. The great photographic strength of the coronal rays as compared with the feeble image of the solar disk in the photograph.

5. That the corona is an electrical phenomenon. The association between sunspots and coronal radiations is, perhaps, the most important feature of the research. If, as appears, we are able to associate particular sunspots with their coronal rays, and study the variation of both at the same time, an immense advantage will have been gained. The research is one that appeals to every student of solar physics, and as it can be pursued by simple and inexpensive means, we may safely predict a rapid increase in our knowledge of the sun's immediate surroundings in the near future.—D. E. Packer, South Birmingham, England. From Popular Astronomy.

ORIGIN OF THE STEEL PEN.—We do not vouch for the truth of it, but a contemporary says: Sixty years ago Joseph Gillott was a working jeweler in Birmingham, England. One day he accidentally split one of his fine steel tools, and being suddenly required to sign a receipt, and not finding a pen handy, he used the split tool as a substitute. This happy incident led to the idea of making pens of metal.

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THE HIPPOPOTAMUS IN THE CENTRAL PARK MENAGERIE, NEW YORK CITY.

No more interesting animals are to be seen in the Central Park Menagerie than the hippopotamus. New York City has been peculiarly fortunate in her experience with the great river horse, having not only succeeded in maintaining some very fine specimens in good condition, but has also been favored by additions to the supply. Early in the morning of March 6, at about 3:30 A. M., a baby hippopotamus was born there rather unexpectedly, making its entrance into its amphibious world a pink-skinned baby of about thirty-five pounds weight. So far all concerned have progressed most favorably.

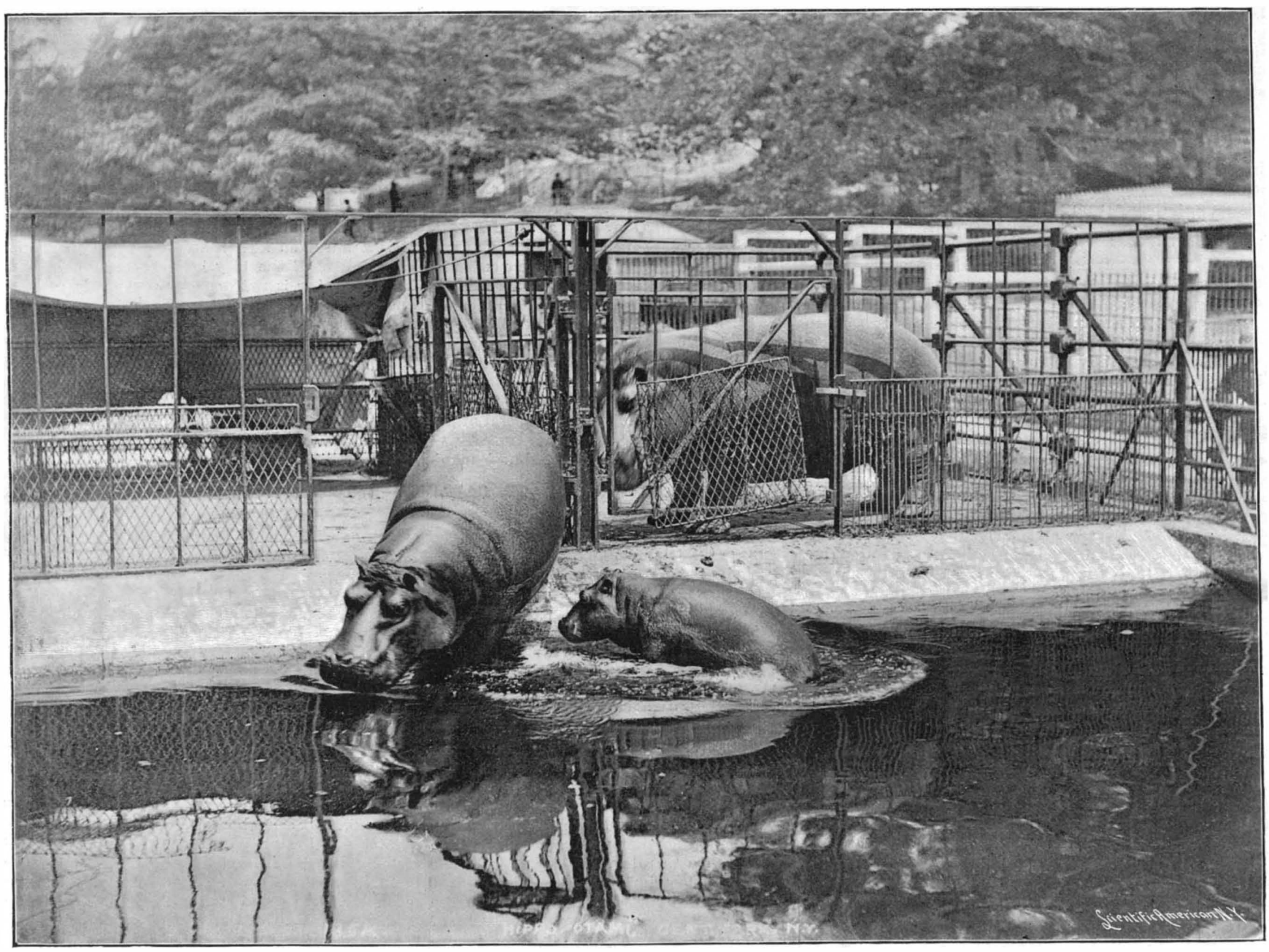
The mother, Fatima, was also born in the Central Park Menagerie, the event occurring six years ago. She now weighs about 4,500 pounds. Two years ago another hippopotamus was born there, but died after two days of existence.

The hippopotamus, etymologically speaking, is a "river horse," such being the translation of the Greek name by which it is designated. In Africa it is termed sea cow (seekoe) by the Boers, a name which is quite inaccurate and which involves the danger of confusion, as the manatee is often termed the sea cow. It is classed as a pachyderm, and is thought not to be a ruminant, so in that sense it is not entitled to the appellation of cow. Its dental development hardly seems to correspond to its vegetable food; yet it has a multiple stomach, like the ruminantia, with a capacity for five or six bushels of vegetation, its large intestine being eight inches in diameter.

The male has been known to reach a length of 17 feet, but 14 feet is a fair average dimension, the females being much smaller. The height of the male is 5 to 6 feet. The great mouth, armed with tusks sometimes over a foot long, opens to a width of 2 feet. The ears, eyes, and nostrils are situated on one plane, so that the six protuberances may be kept above water while the rest of the body and head is below. They are getting rare in their native country.

The rapidity of their growth is rather remarkable. One very young specimen was captured in Africa, on the bank of the Nile, in 1849, and was brought successfully to London. When about ten months old it had attained a length of 7 feet, with a girth of 6½ feet. Clumsy as they seem, it is said that they can move with remarkable rapidity on land.

Our illustration shows three specimens in Central Park, taken at an unusually favorable moment, as it is not easy to obtain so good a view. The animals are very apt to persist in remaining under water, especially when an impatient audience is awaiting their appearance.



THE HIPPOPOTAMUS IN THE CENTRAL PARK MENAGERIE, NEW YORK CITY.

Cranberry Culture.

Early cranberry growers were beset by many difficulties and discouragements, says a writer in the Detroit Free Press. Few of them succeeded, simply for the reason that they had everything to learn, and this branch of agriculture demands exceptional knowledge and skill. However, about the time of the civil war some bogs produced enormous crops of berries, for which extraordinary prices were realized. Money was then plenty and speculation was rife. Large amounts of capital were invested in the new and promising enterprise. Most of the investors came to grief, their bogs proving total failures. In fact, from that time until now failure in cranberry culture has been the rule rather than the exception.

The culture of cranberries turns to profitable account otherwise worthless swamps. Parly overflowed areas are most suitable for the purpose, because the land must be periodically flooded with water in order to protect the vines from frosts and destructive insects. The bog is first stripped of vegetation by cutting away the upper layer of turf and removing it. On the surface a coating of sand three inches to one foot in depth is placed, in which the plants are rooted. Then by convenient dams the surface is made ready for flooding at the required time. Farmers say that the roots of the plants strike down through the sand and into the soil, getting their nourishment from the latter. This is probably a mistake, the scientific opinion being that the cranberries grow wholly in the sand, getting such nutrition as they need from the water. Over 100,000 acres of Northern swamps are devoted to cranberry culture. On Cape Cod this is a great industry, and so profitable that it has very much improved the condition of the region.

Unlike other agricultural products, cranberry vines growing on suitable soil require no manure and no tilling to keep them in good condition. When once established, a plantation will last for many years, yielding regular annual returns. However, a large expenditure of labor and money is necessary to start the business. From six to nine years must elapse before a new bog will begin to bear a paying crop. Frosts, droughts and occasional fires threaten the grower, not to mention grasshoppers, katydids and various other insects which devour the plants.

The month of October is the time for gathering the crop. The berries are sometimes collected with a kind of rake specially constructed for the purpose, but the finest ones are picked by hand like strawberries. When picked in the sun they are placed in trays in the shade to cool. Before packing them for shipment they are run over a platform slightly inclined. The rotten and bruised fruit does not run off, but sticks to the platform and may be scraped off and thrown away. One big New Jersey company gathers its berries while green. They are then placed on the bare ground under an open shed, spread evenly, and are permitted to ripen for six or eight weeks. In this way they acquire a beautiful bright red color. The average life of a cranberry bog is about eighteen years.

Encouragement for the cranberry abroad is afforded by recalling the early struggles of American apple growers for a market in England, where now enormous quantities of apples from the United States are sold. Great Britain places no tariff on our food products, but her people are slow to learn to eat anything new. The cranberries hitherto exported to Europe have been consumed over there by Americans, just as many foreign products are brought hither and consumed by Italians, French and Russians, without becoming known to our own people.

The most important point in cooking cranberries is to use only porcelain or enameled utensils.

The crop for 1894 was the biggest ever gathered in the United States—over 1,000,000 bushels—and the principal growers contributed by agreement 3 per cent of their product to pay the expenses of introducing cranberries into England. A gentleman of Trenton, N. J., was sent across the water for the purpose. On reaching Liverpool he found in that city only one dealer in cranberries, a small girl in the market, who said she never ate her wares herself "because they tasted like medicine." She only sold them to a few Americans.

STEEL-COATED BULLETS.—Steel-coated rifle bullets for the new magazine guns cause very little pain, says Dr. Delorme, surgeon-in-chief of the French army. During the riots at Fourmies one man was wounded so badly as to be paralyzed, but did not suspect that he had been shot until he saw blood stains on his clothing; one, shot through the leg, only felt a slight shiver; another, shot through the arm, felt his elbow twitch and closed his fist mechanically. At short range, 100 to 150 yards, the bullets are apt to explode and to do serious mischief.

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Points for Bicycle Riders.

Subjoined are some excellent directions for bicycle riders, compiled by the Evening Post, to whom we are indebted.

In the average bicycle there are about 140 steel balls. These are generally distributed as follows: Front wheel, 16; back wheel, 18; crank shaft, 28; pedals, 20 each; front steering head, 40. These are of different sizes, those used in the front wheel generally being one-sixteenth of an inch larger than those in the back; the balls in the pedals are about one-eighth of an inch in diameter. With such a number of points at which there may be friction, it will readily be seen that even the smallest imperfection would have a very material effect upon the running qualities of the wheel. For this reason more care is taken in their manufacture than in that of any other part of the wheel. The perfect bicycle ball must be absolutely exact as to gage. It must be highly polished and it must be so hard that even an emery wheel will have little effect upon it. The other parts of the bearings are also very important, but perfection in them is not so difficult to secure as in the balls. The ball cups on nearly if not quite all machines are forced into their places in the wheel, pedal, or bracket by hydraulic pressure and are practically as solid as if they were brazed or welded to the part in which they fit. The cones which press the balls into their places in the cups are removable, and in case of any imperfections can be easily and cheaply replaced. Perfect bearings should be the last things to wear out in a wheel, and years of use should only be evidenced by a bright streak in the ball races, showing where the balls had run. While all wheels are now fitted with what are claimed to be "dust-proof" bearings, such a thing has yet to be devised, and therefore most of the bearings need frequent cleaning. It is not necessary, however, to take apart the bearings in order to clean them; benzine poured into the oil holes does the work as well as if each individual part had been wiped with a clean rag. To clean the bearings in the bracket the best way is to remove the saddle-post and pour the benzine into the tubing, which will generally be found to have a small hole in the bottom which admits the benzine to the bracket. This should be continued until the benzine runs out perfectly clear, indicating that all the dirt has been removed. The bearings, especially those on the back wheel, should not be adjusted too tightly, but should be loose enough to allow very little side motion.

There is nothing so important in the "tool rack" of the bicyclist as the lubricant, and it should be carefully chosen. If too thick, it will gum and cause unnecessary friction; if too thin, it will not perform its duty. When oil is introduced into the bearings of any piece of machinery it forms minute globules and acts as rollers or balls, separating the axle or other point of contact from the collar surrounding it and within which it revolves. In the absence of these little crystals of oil the axle and the inside of the hub grind on each other and trouble ensues. The steel balls which are used in the bearings of a bicycle of course tend to minimize this friction, and were it possible to make absolutely dustproof bearings, there would be use for very little oil, applied at long intervals of time. But every little particle of dust increases the friction and retards the rolling of the balls, tending to make them slide instead of rolling. The best oil is composed principally of sperm and kerosene oils, generally two parts of sperm to one of kerosene, boiled together. The sperm oil, while in itself a good lubricant when first applied, is too thick. The kerosene which is used to thin the sperm oil also cuts out the dirt or other foreign substance and aids in keeping the bearings clean. A few drops of oil applied at the proper time and in the proper place are much better than a whole canful of oil, and the best results are obtained from a small quantity dropped into the bearings every time the wheel is taken out. There are some lubricants manufactured which are claimed to be equally efficient in cleaning the bicycle, lubricating the bearings and also the chain, but as a general thing the oil which is best for use in the bearings is an absolute failure when applied to the chain. For the chain a lubricant is necessary which will form a coating over the links, preventing them from grinding on the sprocket wheel, causing that clicking, biting noise so familiar to the novice who has not yet learned to take the proper care of his mount. The most approved article for this use is composed of lampblack, kerosene, and beeswax. These ingredients when compounded in proper proportion form a mixture that when applied to the chain does not collect dust to any great extent, is lasting, and makes the chain run smoothly over the sprocket. In the absence of other chain lubricant, common brown soap forms an excellent temporary substitute. After spreading the lubricant along the links the chain should be wiped off; enough of the lubricant will adhere to answer all purposes.

It is not necessary now to clean the pedal bearings or to oil them more than twice a year. In the pedal, dustproof bearings, so called, have reached a high degree of perfection, and the dustiest or muddiest road may be ridden on a wheel equipped with high grade pedals without fear of dirt grinding into and injuring the cones and ball cups. A poorly constructed or imperfectly designed pedal can, however, cause as much trouble as any other part of the wheel. The burs on the end of the pedal axle may become loose or worn, tighten up by the revolution of the cranks, and thus throw off the foot of the rider at every revolution, or they may become loose and allow the top of the pedal to strike the crank hanger as it comes around; in fact, there are a thousand and one little troubles for which the pedal may be responsible. Crank hangers have also been a source of trouble, the almost universal use of the cotter pin by which the crank is keyed to the shaft being chiefly at fault. It is a very hard matter to key on these cranks in such a manner as to prevent them from working loose on the axle and causing a squeaking or grinding. Many wheels now have devices which do away with the cotter pin. Toe clips, while ridiculed by a great many riders, are very useful at times, both in ascending and descending steep hills. With their aid a rider is able to apply nearly a fourth more power, either pushing ahead or back-pedaling. They may be attached to either rubber or "rat-trap" pedals, and can be used or not at the option of the rider.

A poorly adjusted saddle may cause an injury that will last a lifetime. The front of the seat should be lower than the back, but not so low as to cause the rider to slip forward or to cause the greater part of his weight to rest on the handle bars. Women in particular should be careful in this respect, and instructors cannot impress too strongly the importance of a proper adjustment of the saddle. Many riders prefer the saddle placed well forward over the pedals, while others ride with their seats behind the upright post, which fits into the frame. However, it is conceded by experts that the proper method is to put the rider as nearly over the pedals as possible. Many saddles are now made with a very broad, flat back and a very narrow front, and some well-known makers have discarded the nose entirely, leaving the saddle simply a broad, flat seat. Some newly invented contrivances are arranged so that the saddle responds to every movement of the body and limbs. The general utility of these is to be tested as yet.

Riders, dealers, and manufacturers are almost unanimously in favor of a strong, rigid seat, as hard as asphalt, with only enough spring to take up the vibration of a wheel upon a level surface, the rider taking care to lift himself over a rough piece of road by rising in his pedals, thus making it as easy as possible both for himself and for his mount.

There are few parts of a wheel which need more attention than the tire; a mishap there frequently means a walk home or the taking of passage on a railroad train where one is handy; punctures and "blow-outs" are of more frequent occurrence than a leaking valve or tire. There seems to be a difference of opinion upon the proper inflation of a tire, some claiming that on a hard, level road the tire should be as tight as possible, while on choppy macadam highway it should be slightly moderated, but not so much so as to make it liable to be cut into by the pressure of the rims upon it; while others believe in having it fully inflated at all times. An inflated tire should never be exposed for any length of time when not in use to the rays of the sun on a hot day, nor should it be left standing in a warm room during cold weather.

There is a great deal to be said on both sides of the brake question. Nost expert riders disdain the use of the brake as being unnecessary and tending to promote carelessness, besides wearing out tires. From their point of view they are correct. A man who is able to dismount from his wheel going at a high rate of speed, on either side of the machine, or back of it, who is able to back pedal, or brake with the toe of his foot on the front wheel, and never loses his head under any circumstances, needs no brake. He can take care of himself and of the pedestrians. A rider who is not able to do all this should by all means have a brake. If the ordinance relating to speed were strictly enforced brakes would be superfluous, but it is almost an impossibility to hold wheelmen down to eight or ten miles an hour. The wheel of to-day runs so easily that the rider does not realize how fast he is spinning along.

The most effective brakes now in use are foot brakes, placed on the front fork. They weigh little and will stop a wheel in a very short distance. No one but an expert wheelman should attempt to ride through the crowded streets of New York, and he should have every faculty on the alert, always looking for the unforeseen to happen—for truck drivers, coachmen, and pedestrians to do exactly the opposite to what he would naturally expect of them. All women's wheels should be equipped with effective brakes, and riders should be taught the use of the brake before attempting to ride outside of the walls of the academy.

In wheeling, as in horseback riding, driving, etc., there is a correct and an incorrect position, often the result, to a greater or less extent, of the position of the handle bars. One of the first principles is balance. Once acquired, the rider is master of the wheel, and grace and carriage then become a question of patience and practice. An awkward carriage or position is evidently the rule with the majority of wheelmen. A prevalent idea is that the nearer the position assumed resembles that of the racing cyclist, the nearer perfect it becomes. This assumption is decidedly wrong. The two positions, that of the racing man and that of the road or pleasure rider, are not related, and should not be confused. The racing man in the correct position of a road rider could not obtain anywhere near the speed necessary to win a race, while the road or pleasure rider only adds more weight and fatigue to himself by riding after the style of a racing cyclist. The position for good road riding is with the body straight, with a slight bend from the waist and not from the back, with the shoulders thrown back and the head up. The racing position is just the opposite. According to the opinions of numerous wheelmen, an easy riding carriage cannot be obtained by having the handle bars on almost a level with the upper brace or top tube.. The handle grips should be so elevated as to be parallel with the seat, and the seat so adjusted as to permit the heel of the shoe worn by the rider to rest lightly upon the pedal when the leg is fully extended. In the correct position the cyclist should at any moment be able to take his hands off the handle grips and not alter his position in the slightest. It gives him perfect mastery over his wheel in case of danger. In the racing style there is hardly a muscle, above the waist, that is not thrown out of its proper place. The shoulders are forced back until they almost meet, while the neck and lungs are misplaced, thus preventing proper breathing and action. It also slowly but surely works a physical deformity in the carriage of the rider when off a wheel. It is a mistaken idea that the tighter one grips the handle bars of the bicycle the better one can ride. The balancing is not done by the hands, after once knowing how to ride, but by the feet upon the pedals and the legs against the frame. The handle bars are only necessary for the purpose of steering, mounting, dismounting, and for leverage. In the correct position the arms of the rider can be perfectly straight, with the elbows set if desired, or slightly bent at the elbow, so that in going over rough roads he is able to prevent much of the jolting that naturally occurs.

Helium.

In 1868, when the spectroscope was first directed upon a solar eclipse, the famous D-3 line, the bright yellow line near the D lines of sodium, was first seen in the prominences. It has no corresponding dark line in the ordinary solar spectrum. Frankland gave to the unknown substance to which this line was ascribed the name of helium, as if it were indigenous, so to speak, to the sun. After this, D-3 was detected in the stellar spectra, but it was not found in any part of the earth, which was strange, and could not be accounted for, if indeed the earth is a child of the sun, and not an aggregation of independent materials. If the nebular hypothesis is true, the earth should show its kinship to the sun by distinct marks of inheritance, and among others helium, unless, indeed, all the helium that ever was in the earth became free, and its molecules, having a velocity of more than seven miles a second, had left the earth to seek some body of greater gravitating power. And thus the inquiry rested until Lord Rayleigh and Prof. Ramsay announced the discovery of a new substance in our atmosphere. They had noticed that the density of nitrogen taken from the air differs about one half per cent from the density of nitrogen obtained in any other way. This element that so strangely affected atmospheric nitrogen and gave it a distinctive character, they separated by the action of magnesium, and a new gas was evolved whose density was fifty per cent greater than nitrogen. This they called argon, because "it did no work," although, indeed, that negative character could not have been attached to these indefatigable chemists. Last March, Prof. Ramsay, seeking to ascertain if this youngest born of scientific discovery could combine with anything else, was examining the rare earth found in Norway known as cleveite. When treated with weak sulphuric acid it gave off argon, associated with something else, which he described as "a gas which has not yet been separated." It was submitted to Prof. Crookes, and it was proved to be helium imprisoned in the cleveite, and thus helium is now a misnomer, and the earth bears another possession from her great sun mother, although it is of such a light and frivolous character that if released from its rocky prison it will fly sunward and seek once again to nestle in the bosom of that fiery power that gave it birth.—Transactions of the Astronomical and Physical Society, Toronto.

THIRTY-EIGHT centenarians were recorded in Great Britain last year, fifteen men and twenty-three women. The oldest was Mrs. Henry, of Gortree, who died at 112. In the last ten years the St. James's Gazette has kept track of 378 centenarians, of whom 143 were men and 235 women.

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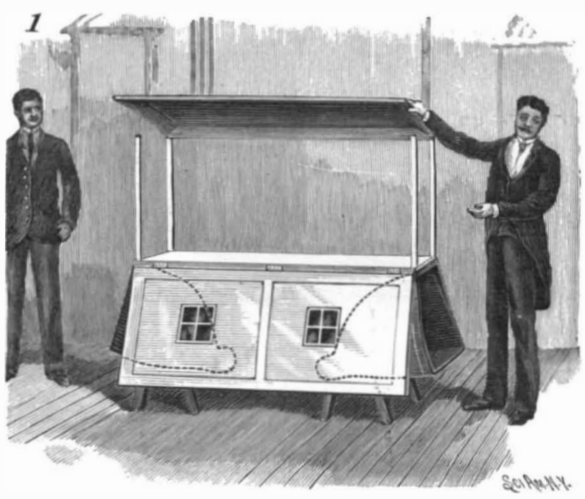
"AFTER THE FLOOD" AT THE OLYMPIA.

At the Olympia Music Hall, in this city, a very clever performance in the order of natural magic has been exhibited, with whose true inwardness our readers may desire to be acquainted. In the production of a really good illusion, scientific interest is often involved, and



THE ARK OPENED FOR INSPECTION.

the details have to be complete and perfect to obtain favor with the court of last resort—the public.

The curtain rises and shows upon the stage what is to be interpreted as a representation of Noah's ark, a rectangular box with ends added to it, which, curving upward, give it a boatlike aspect. It stands upon two horses or trestles. The central cut, Fig. 3, shows the ark in its entirety. The exhibitor opens it on all sides, swinging down the ends and the front and back lids, and raising the top as shown in Fig. 1. It will be noticed by the observant spectator that the back lid is first dropped and that the assistant helps throughout, the reason of which will be seen later. The skeleton or frame of the structure is now disclosed and it is seen to be completely empty. It is now closed, this time the back lid being swung into place last, and all is ready for the flood. This is represented by the water, poured in ad libitum through a funnel inserted in an aperture in the upper corner. To the audience it seems as if the ark were being filled with water. In reality, the water simply runs through a pipe, carried through one of the legs of the trestle, and so down beneath the stage. The management of the flood is illustrated in our cut, Fig 2.

After the flood the exit of the animals from the ark is next to be attended to. Opening windows in its front, a quantity of animals and birds are taken out as shown in Fig. 3. Ducks, chickens, pigeons, cats, dogs and a pig are removed and run around on the stage or fly about, and it is wondered how so small an inclosure could contain such a collection. It is also to be observed that none of the animals are wet—the water has not reached them. More, however, is to

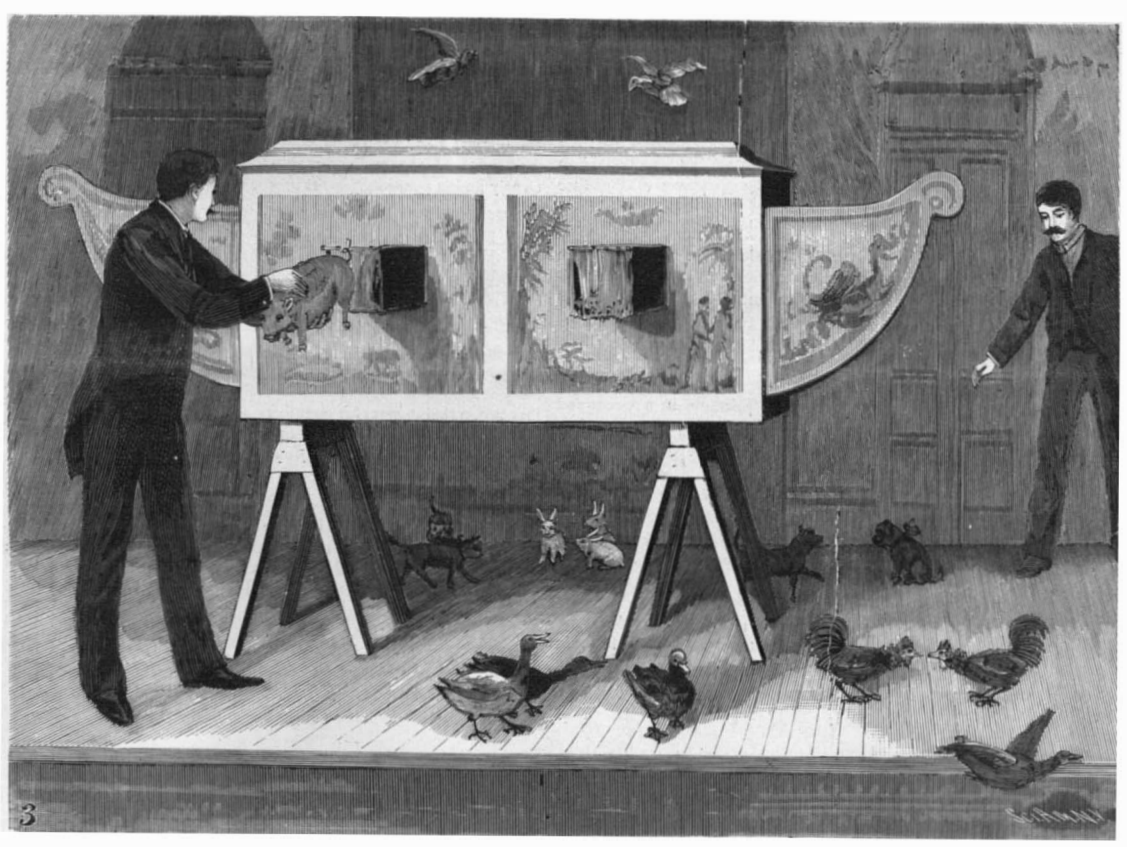
THE LADY TENANT OF THE ARK.

follow, for the exhibitor now lets down the front, and a beautiful Eastern woman, Fig. 4, reclines gracefully in the center of the ark, which has only room enough to accommodate her. Where the animals came from, and how they and the woman could be found in the ark, which, when opened before the audience, seemed completely empty, and how they escaped the water, are the mysteries to be solved.

Our cut, Fig. 5, completes the explanation. The ends which are swung up and down in the preliminary exhibition of the ark are the receptacles which accommodate the animals and birds. They are stowed away in these, are swung up and down with them, and are taken out through apertures in their fronts.

The woman, the other tenant, is fastened originally to the back lid. When the ark is opened for inspection, this lid is swung down, ostensibly to enable the audience to see through the ark—in reality to prevent them from seeing through the illusion. For, as stated, it is swung down before the front is opened, and as it goes down the woman goes with it, and remains attached to it and out of sight of the audience, who only see the rear side of the door as it is lowered. Fig. 5 shows the rear view of the ark when open, with the woman in place on the rear lid, and also shows the animals in place in the side compartments.

The illusion is exceedingly effective, and is received with high appreciation by the audience. To those who understand it, the performance is of heightened interest.



TAKING OUT THE BIRDS AND ANIMALS.

Roentgen Photography.

A systematic study of the transparency of different substances to the X rays has been made by Maurice Meslans, whose paper appears in Comptes Rendus. He found that carbonaceous organic substances containing only carbon, hydrogen, oxygen and nitrogen were relatively transparent; that sulphur, iodine and inorganic substances generally were opaque, and that the introduction into the molecule of an organic compound of one or more atoms of sulphur, iodine or similar inorganic element produced opacity What is very interesting is that this affects such compounds as sulphates. Thus the sulphates of the alkaloids were opaque on account of the sulphur in the sulphuric acid radical Therefore the opacity of the bones is to be attributed to their mineral or inorganic constituents. Iodine proved one of the most opaque of all the elements tested. This would suggest injection with iodine solution as a means for photographing internal cavities.

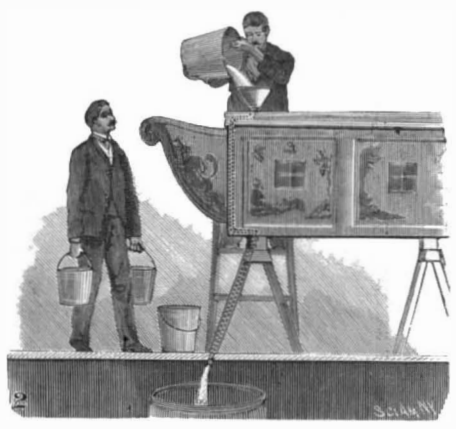
From Edison's laboratory comes the announcement that calcium tungstate has high fluorescent power for X rays, being far superior to the barium platino-cyanide.

The University of Pennsylvania is a claimant for the honors of having taken the first X ray photograph. It was taken on February 22, 1890, was obtained accidentally, and was treated simply as inexplicable, and nothing further was done.

An interesting surgical case is reported from McGill University, where a bullet was located in a man's lower leg, between the tibia and fibula, and was successfully removed. The photograph confirmed the diagnosis, as the bullet had been located by the surgeon, Dr. Robert C. Kirkpatrick. A wire was wound around the leg near the wound to give a base for measurement.

Some interesting results were obtained by Mr. Alexander Macfarlane, who photographed endways a quantity of nails driven into a board. The radiating direction of the shadows showed conclusively the radiant action of the rays. Experiments in refraction and reflection of the rays were definitely negative.

Several investigators—Swyngedauw, Borgman, Gerchun—have tried the effect of X rays upon electric discharge between electrodes. The rays were found to greatly increase the sparking distance. Translations



THE FLOOD.

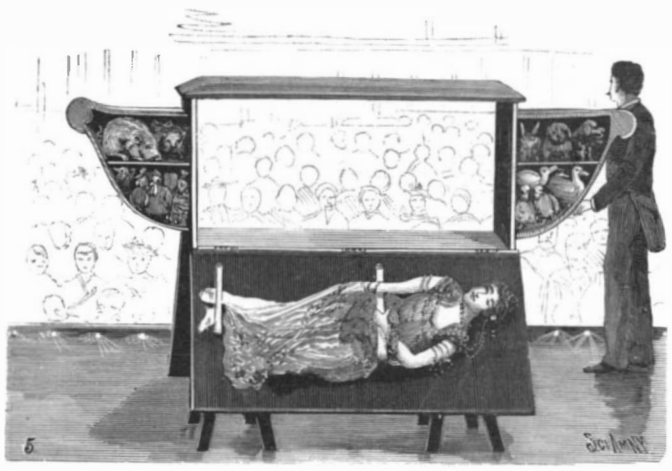
of their papers appear in the London Chemical News.

A paper by Drs. Houston and Kennelly is devoted to the work in the Edison laboratory, and gives the working factors and conditions. Thin walled tubes of German glass with inner and outer electrodes in parallel proved the best. Roughly speaking, the time of exposure was found to vary with the square of the distance of the tube from the plate. Long distance, with necessarily long exposure, gave the sharpest photographs.

Elihu Thomson has been working on the problem of obtaining stereoscopic effects. The object is to palliate the inherent defect in the process, which is its inability to give anything better than silhouettes. He finds that platinum in the tube acts to improve the vacuum, and suggests a third platinum electrode. When not in use, this would occlude gas; when heated by use, it would give off gas. Thus a means of adjusting the vacuum would be provided, the platinum electrode only being used to modify the exhaustion.

Nikola Tesla has obtained some remarkable results. He has produced strong photographs at forty feet from the Crookes tube. This has involved the necessity of specially protecting his stock of plates, though he keeps them sixty feet distant from the scene of his experimenting and not even on the same floor. He has used a tube with a single terminal.

He also claims to have proved that about two per cent of the rays can be reflected from a glass plate.



THE MYSTERY EXPLAINED.

It was set at an angle of 45° with the axis of the incident rays and eight inches distant. The photographic plate was at the end of a thick copper tube a foot long.

The axis of this tube was placed at 90° with the axis of the rays.

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RECENTLY PATENTED INVENTIONS.

Engineering.

ENGINE.—Robert D. Knight, Vinita, Indian Territory. This is an engine more especially designed for use on locomotives, the invention covering an improvement whereby the engineer may control the introduction of steam into the cylinder regardless of the slide valve. The cylinder is connected by the usual ports with the steam chest in which operates the slide valve, and in the ports are arranged plugs which may be turned to close the ports and connect them by additional ports with the exhaust. The outer ends of the plugs are connected with each other and with the locomotive cab, permitting the engineer to change their position as desired, singly or collectively.

GAS OR VAPOR ENGINE.—Frederick W. Mellars, San Francisco, Cal. This engine is designed to be of very strong and durable construction and highly efficient in operation. It has a rocking valve adapted to open and close the gas inlet and exhaust, the valve being operated by a cam which, during the part of its revolution corresponding to the compression and expansion periods of the engine, holds the valve stationary and in a closed position over both inlet and exhaust.

VAPOR ENGINE. — Isaac F. Allman, Jersey City, N. J. This engine has a governor comprising a spring-pressed block mounted to slide on a running part of the engine and formed with an oblique groove engaged by a lever fulcrumed on the running part, while a sliding sleeve is connected with the lever and with the part to be governed. The improvement is designed to enable the engine to be governed with great precision, the governor acting positively and quickly when an abnormal speed is attained, causing the exhaust valve to remain closed to prevent the escape of burned gases and a drawing of the mixture into the cylinder until the speed is reduced.

Railway Appliances.

SWITCH.—William W. Doty, New York City. This is a switch especially designed for use on street railways, the switch being normally closed to the side track, but being opened, when desired, by pressure of the foot upon a lever projecting up through the car platform, as the car comes to the proper place, the switch being closed after the car has passed by the wheels coming in contact with another lever. Should the switch point be accidentally moved by a passing vehicle, a spring causes it to swing back to closed position. The entire construction is simple and not liable to get out of order.

RAILWAY GATE.—Samuel L. Reed, of Ebensburg, and William S. Reed, of Johnstown, Pa. This is an improvement in gates used at crossings, to close the roadway on the approach and passing of a train, and comprises a shaft connected with a pivotally mounted gate and having a flexible connection with cams adjacent to the track and adapted to be moved successively by a passing train. The device is so arranged that the gates are also automatically opened when the train has passed the crossing.

SIGNAL LANTERN.—Willard R. Dodson, Jermyn, Pa. This lantern is designed to burn both day and night for a week without attention and consuming but a very small quantity of oil, although giving a large degree of radiation, sufficient for signaling. The wick is made of a sheet of cloth and a sheet of asbestos paper, and is practically imperishable, needing but slight adjustment at long intervals. The lamp also combines various improved details designed to add to its commercial efficiency and insure its durability.

Agricultural.

PLOW.—Joseph J. Bonen, Iron Mountain, Mich. This is a plow especially adapted for the cultivation of the potato, or for drilling for planting or for digging potatoes. It is fitted with adjustable wings or mould boards, so that it may be accommodated to growing plants, and is provided with a shovel, which is detachable from the share and the stock, so that the plow may be used for ordinary purposes when desired. The share and stock are so made that in new ground the weeds will be cut as the plow is drawn forward.

CULTIVATOR SEEDER ATTACHMENT.—William R. Frost and William H. Butlin, Croton, Iowa. An attachment particularly adapted for sowing oats in corn ground or wheat in corn stubble, or like purposes, has been devised by these inventors, the attachment being used as readily on rough ground or on a hillside as upon smooth ground. Means are provided for controlling the amount of seed to be dropped per acre, the seed being dropped in front of and covered by the cultivator teeth, the seed box being close to the ground, so that seed will not be wasted in windy weather, and the planting and raking in of the seed being performed in one operation.

Miscellaneous.

BICYCLE SADDLE.—Sylvester J. Brown, Denver, Col. This inventor has devised a solid seat or saddle having a tree of wood or similar material, a waterproof covering of rawhide, and a suitable leather top, the saddle tree being made and shaped to give a maximum degree of comfort to the rider. The tree is formed in three sections, a body section forming its rear portion having a forward angular recess extending from end to end, while two side sections fit in the recess and are connected on a substantially central line and shaped to form a portion of the body and a horn.

SALUTING DEVICE.—James C. Boyle, Spokane, Washington. To lift the hat automatically in saluting, without raising the hand, this inventor has devised a mechanism principally contained in a casing inside the hat, there being on the lower side of the casing curved spring fingers which gently clasp the head of the wearer. In a hat containing this mechanism, when the wearer bows, the swinging of a pivoted weight block pushes a rod whereby a spring is released and an arm is operated to raise a bow piece to which the edges of the hat band are attached, the swinging back of the weight, as the wearer resumes an erect posture, causing the hat to drop into its normal position on the head.

PENCIL HOLDER AND CLIP.—William E. Quinn, Anniston, Ala. This is a simple device for the use of conductors, engineers, telegraph operators, etc., the device being a holder for a pencil or pen and also adapted to receive train orders, telegrams, etc., the holder being also conveniently attachable to any portion of the wearing apparel. On the front face of a back plate is pivotally mounted a spring-pressed clamping plate with pencil-holding fingers struck up from its central portion, while on the upper end of the back plate is pivoted a spring clasp.

COPYING PRESS MOISTENING DEVICE.—Wallace S. Hampsher, Mount Vernon, N. Y. This moistener comprises a pan adapted to hold between guide strips a block on which the sheets to be moistened are placed, the water in the pan rising nearly to the surface of the block, and the sheets being moistened by capillary attraction. The sheets are covered by a cover or presser plate with inclined top surface, and whose marginal edges come within and slightly below the upper edges of the pan.

PILE FABRIC. — Ludger Beauregard, St. Joseph de Levis, Canada. This is a fabric designed to form an imitation of Persian lamb, and consists principally of a fabric backing and a heavy strand of wool or other material interlaced with and knotted on the backing in a particular novel manner to form raised loops on the face of the backing. The strands forming the loops are made of a large number of loops which readily spread and fill the spaces between the adjacent loops, and the dyed fabric is singed to more closely imitate Persian lamb.

METALLIC ROOFING, SIDING, ETC.—Pressly C. Patterson, Cambridge, Ohio. This is an improvement in the construction where the sheets or sections have parallel raised and depressed portions and interlocking side and end flanges for forming seams with adjacent sheets or sections, the improved construction having raised portions to form continuous air spaces and depressed portions forming channels for carrying off the water, while also forming a concealed lock, and a secret nailing flange extending under the raised body portion, while warping is prevented.

METALLIC ROOFING.—This is a further patent of the same inventor, providing more especially for the prevention of leaking, the sheets having interlocking side flanges for forming seams with adjacent sheets and a nailing strip extending under and formed on its top and at one side of the seam with a gutter for carrying off water leaking past the seam. This roof need not necessarily be laid on tight sheathing, but may be laid on laths from one to two feet apart, depending on whether light or heavy gage metal is used for the sheets.

FIRE EXTINGUISHER.—George W. Cofran and William J. Murray, Baltimore, Md. This is an improvement in automatic extinguishers in which a fusible closure is provided upon the nozzles or outlets, and affords a simple means by which a reduction of air pressure in the pipe system will effect a flow through the system of gas, water or other extinguisher. The arrangement is such that when a certain diminution takes place in the pressure in the pipes a diaphragm in a connected tank falls, freeing a plunger and releasing the extinguishing fluid, the nozzles opening automatically on a sufficient rise in temperature.

CURTAIN FIXTURE. — Joseph Darling, Peachville, Pa. The curtain roller, according to this improvement, is of the automatic type, but the spring stud has an attachment composed of a headlike portion with inwardly facing flange or shoulder, there being a portion adapted to be pressed into locking contact with the spring stud of the roller. The invention affords improved means for connecting the roller with its main supporting bracket, for braking the curtain operating and supporting cord, and for connecting the cord to take up slack and level the roller.

INHALER. — Lyman P. Walter, Chicago, Ill. To facilitate inhaling various medicaments, this inventor provides a device which may be nested in small space and carried in the vest pocket, comprising a nose piece having an open side to fit over the nose and at the bottom a projecting nipple and cup to receive the medicament, the latter being preferably held in a small piece of sponge or other absorbent. The several parts of the device consist of three separable pieces and are preferably made of hard rubber.

CAN OPENER.—Oliver C. Thompson, Emporia, Kansas. This device consists of a slotted and sharp pointed lever to which a knifeholding clamp is adjustably attached, the point of the lever being adapted to pierce the head of a sheet metal can, and the knife or cutter being adapted to make a circular cut when the lever is turned on its point. The construction is such that the metal is severed by a clear draw or shear cut, enabling the lever to be operated with great ease.

CHICKEN COOP AND TRAP.— James M. Harvey, Palmyra, Tenn. This inventor has devised a coop in combination with a trap in which animals seeking to prey on the chickens may be caught and retained. It has two compartments, with a communicating door, one compartment for the chickens to live and roost in, and a trap section into which they are admitted to feed and exercise. Animals entering the trap section to prey on the chickens are imprisoned there.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

ARTESIAN WELLS AS A MEANS OF WATER SUPPLY. By Walter Gibbons Cox. Brisbane, Sydney, Melbourne and Adelaide: Sapsford & Company. 1895. Pp. 148. Price $3.

In Australia an immense effect has been produced by artesian wells, and in California also the most important results have been obtained by them. This work, giving the most practical results in these and other countries, is very acceptable. Naturally, Australia receives the principal part of the attention, but America is not slighted. The list of topics purporting to be an index is exceedingly unsatisfactory and is an actual blemish to the work.

WEATHER AND DISEASE: A CURVE HISTORY OF THEIR VARIATIONS IN RECENT YEARS. By Alex. B. MacDowall. London: The Graphotone Company. 1895. Pp. 83.

In this book the curve system of obtaining results is extensively applied to the particular subject, and the author seems to have considerable confidence that by it he will obtain valuable results. The relations of climatic and weather conditions to hygiene have of late years received more scientific treatment than of old. This book is a step in that direction.

HOWELL'S STEAM VESSELS AND MARINE ENGINES. By G. Foster Howell. With a closing chapter on sailing ships and schooner yachts. New York: Published by the American Shipbuilder. Pp. 183. No index. Price $5.

This excellent treatise gives a somewhat general review of ships of commerce and of yachts, and is particularly interesting from its presentation of the most modern types of vessels, including four and five masted sailing and auxiliary ships, and many classes of steam vessels, of engines and of equipments now being turned out from the different yards. People familiar with the shipping of America will have no difficulty in recognizing many old friends among the illustrations, which add very largely to the charm of the book, it being made up almost more of cuts than of text. The presentation of new and less familiar rigs is another feature. A most interesting series of portraits of well known ship builders and others interested in marine engineering completes the work. The absence of an index, however much it may be regretted, is compensated for to a very great extent by a full table of contents.

ELEMENTARY TREATISE ON ELECTRICITY AND MAGNETISM. Founded on Joubert's "Traité elementaire d'Electricité." By G. C. Foster and E. Atkinson. New York, London, and Bombay: Longmans, Green & Company. 1896. Pp. xix, 552. Price $2.25.

This work is a modified translation of Joubert's "Traité elementaire d'Electricité," made with his consent and his authorization for the changes which the authors deemed it advisable to make in its arrangement. All that is necessary to say of it is that it treats very fully of its titular subject and that it forms another excellent addition to the library of the electrician, which will be, we are confident, very valuable and acceptable to many. It is printed clearly and is certainly a most useful work.

ELECTRICITY UP TO DATE FOR LIGHT, POWER AND TRACTION. By John B. Verity. London and New York: Frederick Warne & Company. 1896. Pp. xii, 238. Price $1.

The preface states that some 20,000 copies of this work, now in its fifth edition, have found their way into circulation. It certainly seems a rather brief treatise when its subject is considered, and is devoted largely to English practice. Its interest for engineers in this country will be, of course, not enhanced by the fact that it is devoted to foreign practice, although ideas will certainly, in many cases, be widened by such study.

PETROLEUM. A treatise on the geographical distribution and geological occurrence of petroleum and natural gas, etc. By Boverton Redwood, assisted by George T. Holloway and other contributors. In two volumes, with numerous maps, plates, and illustrations in the text. Vol. I, Vol. II. London: Charles Griffin & Company, Limited. Philadelphia: J. B. Lippincott Company. 1896. Pp. xxv, 900. Price $13.50.

This work we can recommend highly, as it covers the field of petroleum thoroughly. With numerous illustrations and exact technical information, it really seems to have filled what has been a want in scientific literature. Not the least interesting part of it is the section giving a quantity of matter and data which is of recognized value affecting the consumption of petroleum oil for burning purposes. The entire world is gone over for petroleum, the methods of drilling in different parts of the world are explained, and the tools illustrated, and very little that is to be desired will be found lacking. Another interesting feature is the description of the Peruvian oil fields, it being possible that the exhaustion of quinine in Peru and the gradual diminution of other exports will be compensated to some extent by her new petroleum discoveries. An excellent index and a good table of contents add materially to the value of the work.

THE POCKET LIST OF RAILROAD OFFICIALS. Containing the names of officials in charge of railroads, private car companies, fast freight lines and transportation companies of the United States, Canada and Mexico. Also showing the gage of each road, number of miles operated, and rolling stock in service of each company. Published quarterly (January, April, July, and October) by the Railroad Equipment and Publication Company, G. P. Conard, President and Treasurer. J. Alexander Brown, Manager, 326 Pearl Street, New York. Western office, 425 Rookery, Chicago. L. B. Sherman, Western Manager. Pp. 376. Vol. 2. No. 1. Serial No. 5. Price $1 per annum.

Farming, March, 1896. This handsome illustrated monthly, the successor of The Canadian Live Stock and Farm Journal, is published at Toronto, Canada, by the Bryant Press. It is an enterprising, up-to-date periodical, presenting in most attractive form a large amount of reading of interest and value to the farmer, the gardener, the dairyman, and the stock raiser. Among the interesting articles of the March number are "Diarying in the New World," "Profit in Feeding Sheep," "Field Crops in the Northwestern States," "Pointers on Turkey Raising," etc.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6792) G. C. W. asks: Will you please give me through your Notes and Queries column a receipt for a flash powder for photographic purposes? Would like an explosive powder, something of the nature of "Blitz Pulver." A. 1. Magnesium powder, 6 ounces; potassium chlorate, 12 ounces; antimony sulphide, 2 ounces; 75 to 150 grains of the powder should be used. 2. 15 grains of gun cotton and 30 grains of magnesium powder are used.

3. Magnesium..... 40 parts.
Permanganate of potassium..... 40 "
Peroxide of barium..... 20 "

(6793) F. L. S. says: Will you kindly give me the formula for making a preparation for sharpening razors by means of a paste or soap containing something like rogue or emery powder to be rubbed on the strop? A. Mix fine washed emery intimately with fat or beeswax until the proper consistency is obtained in the paste, and then rub it well into the leather strop. For a finer mixture use rouge or putty powder with the wax.

(6794) C. L. says: Will you kindly furnish me the formula for the best and cheapest method of rendering rancid butter sweet, or in other words, to eliminate the smell and render the butter odorless? A. 1. 100 pounds of butter is mixed with about 30 gallons of hot water, containing ½ pound of bicarbonate of soda and 15 pounds of fine granular animal charcoal free from dust, and the mixture is churned together for half an hour or so. The butter is then separated; after standing, it is warmed and strained through a linen cloth, then resalted, colored and worked up with one-half its weight of fresh butter. 2. Rancid butter may be restored, or at all events greatly improved, by melting it with some freshly burnt and coarsely powdered animal charcoal (which has been thoroughly freed from dust by sifting) in a water bath, and then straining it through clean flannel. A better and less troublesome method is to well wash the butter with some good new milk, and next with cold spring water. Butyric acid, on the presence of which rancidity depends, is freely soluble in fresh milk.

(6795) G. M. D. asks how a meerschaum pipe which has been burned in smoking can be fixed so it will color again. A. When once burnt, the pipe cannot be satisfactorily colored, unless the burnt portion is removed and the surface again treated by the process by which meerschaum is prepared. The coloring is produced by action of the smoke upon the oils and wax, which are superficially on the exterior of the pipe, and are applied in the process of manufacture.

(6796) J. O. asks: Will you be kind enough to send me the instructions for making shoemaker's wax? A. This is made by melting together the best Swedish pitch and tallow in a vessel over the fire. The quantity of tallow must be determined by experiment. Roll into balls. The right kind of pitch is of a brown color when fractured.

(6797) J. H. B. writes: 1. I should like to know if the motor which you describe in "Experimental Science" could be modified so as to give the same power

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and speed as it otherwise would, but to take a lower voltage than what it takes as it is? If it can be modified, how much current would it require? A. By using larger wire the motor can be made to run with any desired current, without change of power. 2. I should also be obliged if you would give me a receipt for a small but powerful chloride of silver battery. A. Chloride of silver batteries are not advised except for special work, such as measurements. For descriptions we refer you to our SUPPLEMENT, No. 157, also SCIENTIFIC AMERICAN, No. 3, vol. 72.

(6798) A. R. O. D. says: In answers to inquiries, please advise me if tobacco stems, mixed with a fertilizer, for raising garden truck, will prevent the existence of the cabbage worm. Also give a preparation, if you have one, to prevent or destroy the cabbage worm, if above is not good without injuring same. A. Answer by Entomologist United States Department of Agriculture: Your communication of recent date, transmitting a letter, has been referred to the entomologist, who reports that tobacco stems or dust from the waste of tobacco factories has long been used as a fertilizer and insecticide, having considerable value in both directions. If the cabbage worm referred to is the green cabbage worm, feeding above ground on leaves, the tobacco will be of comparatively little value, although when dusted over the cabbage as a very fine powder it will give some protection. The chief value is where incorporated with the soil against such insects as the cabbage and turnip maggots, and against these it is only a partial protection. It is a valuable repellant to various earthworms and subterranean insects in conservatories. The green cabbage worms are now commonly treated by growers with applications of arsenicals in very dilute form, usually as a powder intermixed with a large quantity of flour, as described in Farmers' Bulletin No. 19, of this department. The applications made in this way fall on the outer leaves and are usually made to the growing cabbages before the heads are mature, so that none of the poison reaches the cabbage head as marketed.

(6799) E. A. T. writes: 1. In a recent issue, A. J. H. asks through Notes and Queries the size of wire to use in winding a telephone magneto for a dynamo. I have made a dynamo in this way, winding armature with No. 18 wire. It will light a 4 candle power incandescent lamp (95 volts), and if only required for lighting the lamp, does not need a separate commutator, as it will do this work as well with alternating as direct current. What is the recipe for composition used in caps for toy pistols? A. The composition used in caps for pistols is usually fulminating mercury. 2. Which armature is best for a motor under ⅛ horse power—Gramme ring or drum armature? A. One is as good as the other. The ring armature is harder to wind. 3. Is it advisable to cast wrought iron field magnet cores in the pole pieces? A. No. 4. Is there any simpler way of making a commutator of twelve sections than that described in SUPPLEMENT, No. 600? A. We advise you, for serious work, to use the method described. For a simple commutator, see SUPPLEMENT, No. 641.

(6800) J. P. S. writes: 1. I have a battery to ring a bell which will run for about two days and then stop. It has a plate of carbon and a rod of zinc in a solution of bisulphate of mercury (3 ounces to the pint). When I looked at it, I found a gray deposit and bubbles of gas on the zinc. I would like to know what gas and what deposit are on the zinc, and how I could remedy this, as I think it stops the current. A. It is probably metallic mercury or some subsalt or oxide thereof, and hydrogen gas. Use one to two parts of salammoniac to one of the mercury salt. 2. Please give me the chemical action of the battery. A. The zinc replaces mercury in the mercury salt, forming zinc sulphate and precipitating mercury or an oxide thereof. 3. How long will the zinc last? A. It depends on how long and how much you use it. 4. Have you a formula for a jet black varnish for iron castings? A. Varnish for Iron Work.—Dissolve in about 2 pounds tar oil ½ pound asphaltum and a like quantity of pounded resin; mix hot in an iron kettle, care being taken to prevent any contact with the flame. When cold the varnish is ready for use. This varnish is for outdoor wood and iron work. 5. Also a formula for a transparent jelly or paste for skin affections. A. Glycerine for Toilet Use, Solidified.—Transparent soap, 1½ ounces; water, 6 ounces; inodorous glycerine, 36 ounces. Dissolve the soap in the water by heat, add an equal weight of glycerine. When dissolved, add the rest of the glycerine, water q. s. to make up the weight. When nearly cold, add any perfume desired. Put in glass jars. It is of a pale amber color, and is transparent. 6. A cement for uniting metals. A. For formulas for cements for metals, see "The Scientific American Cyclopedia of Receipts, Notes and Queries."

(6801) R. W. asks what amount of No. 36 wire to use on an induction coil. This coil will have a hard rubber tube 7½ inches long, 1 inch outside diameter, ¾ full inside, with hard wood heads about half an inch thick, the rubber tube being filled with soft iron wire. I wish to get as long a spark as possible with it. Will three layers No. 20 do for primary coil? Will double wrapped No. 36 do, if just put on layer above layer, without any insulation between each? How much battery do you think it will need? What will be the voltage of the secondary or spark coil? Will a condenser attacned to the primary give any better results? A. We refer you to the following SUPPLEMENTS for full information on induction coils: Nos. 160, 229, and 569. It is not advisable for an amateur to undertake to make too large a one. The approximate rule is that the voltage of the primary coil multiplied by the ratio of the terms in primary and secondary (primary being divisor) gives the voltage of the secondary. The condenser is of utmost importance. A one-tenth inch spark is taken as indicating 10,000 volts potential difference.

(6802) L. F. asks: What horse power would be required to operate a dynamo to run an electroplating apparatus of 10 gallons of solution? What amperage and voltage would be required? A. No answer is possible. Everything depends on the work being done. It would be fair to allow one-tenth horse power, and the amperage and voltage must be regulated by the work being done. We can supply you with a manual on electro-plating, and in our SUPPLEMENT, Nos. 310 and 436, will be found excellent articles on the subject.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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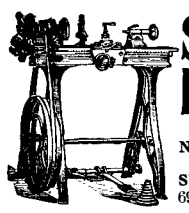

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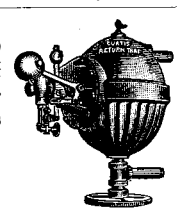

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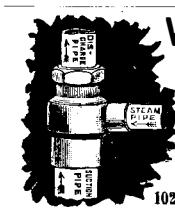

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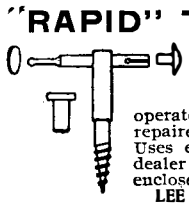

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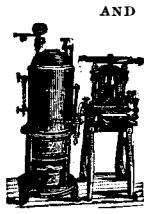

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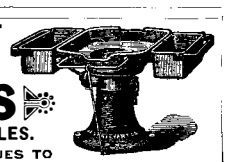

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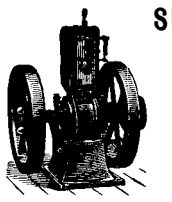

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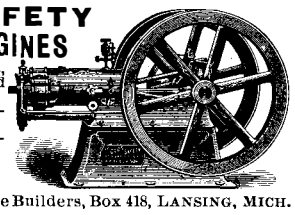

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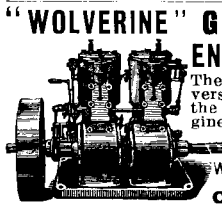

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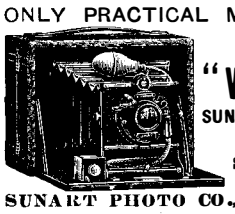

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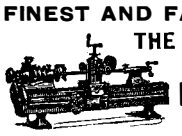

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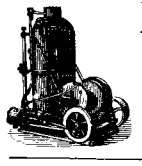

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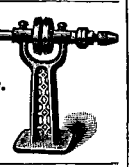

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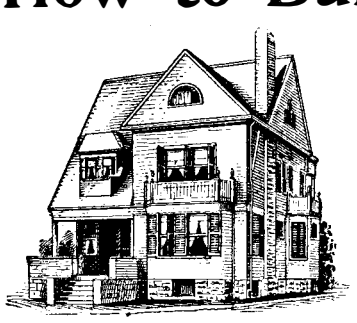

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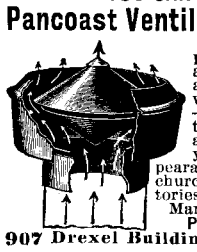

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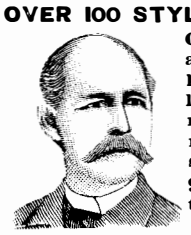

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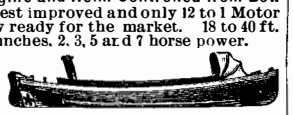

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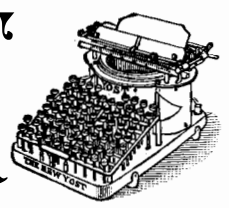

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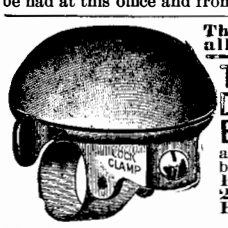

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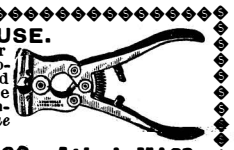

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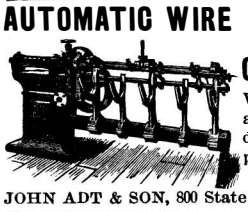

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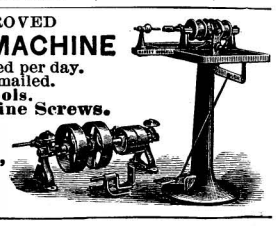

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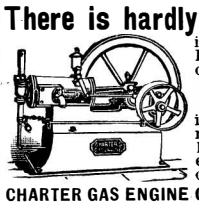

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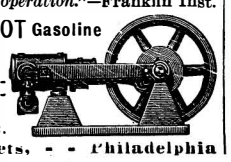

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